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Contents

1 School tasks. There is a lot of school tasks

/en/School tasks/Simple equation, Internal name: **ZsmplurZ**,

Name:

Var.:**1.** Group: Day/Mo/Year:

Solve the equation:

$$-3 + (-4) \cdot 9 - 3 \cdot (-7) - 6 \cdot x = 0$$

Answer:

1:$[x = -3]$

/en/School tasks/Another simple equation, Internal name: **ZsmpluriiZ**,

Name:

Var.:**2.** Group: Day/Mo/Year:

$$36 - (2 - x)^2 - (6 - x) \cdot (x + 6) = 0$$

Answer:

2:$[x = 1]$

/en/School tasks/Another simple equation with fractions, Internal name: **ZurSmpDrobZ**,

Name:

Var.:**3.** Group: Day/Mo/Year:

To find the roots of the equation

$$\frac{x-7}{x-9} = \frac{x-1}{x-7}$$

Answer:

3:$[10]$

/en/School tasks/Another simple equation with a minus, Internal name: **ZurSmpDrobiZ**,

Name:

Var.:**4.** Group: Day/Mo/Year:

To find the roots of the equation

$$(-x - 4)^2 - (x + 2)^2 = 0$$

Answer:

4:$[-3]$

/en/School tasks/Simple text task, Internal name: **ZzemlekopZ**,

Name:

Var.:**5.** Group: Day/Mo/Year:

2 diggers dig 9 meters of trench in 2 days. How many meters of trench will 8 diggers dig in 3 days?

Answer:

5:$[54]$

/en/School tasks/The task of promoting the, Internal name: **ZulitkaZ**,

Name:

Var.:**6.** Group: Day/Mo/Year:

Two turbo snails went to crawled for 85 km. The first speed at 24 km/h more than the second and she crawled to 6 an hour earlier. What were the speeds of turbo snails?

Answer:

6:[34, 10]

/en/School tasks/Task Pro pipes, Internal name: **ZtrubaZ**,

Name:

Var.:**7.** Group: Day/Mo/Year:

Two pipes fill the pool in 20 hours and the first pipe only fills it in 36 hours. How many hours will it take the second pipe only, to fill the pool?

Answer:

7:[45]

/en/School tasks/Pythagorean theorem, Internal name: **ZpifagorZ**,

Name:

Var.:**8.** Group: Day/Mo/Year:

In a rectangular triangle, the length of the hypotenuse is known: $\sqrt{65}$ and the length of one leg: 4. Find the square of the triangle.

Answer:

8:[14]

/en/School tasks/About angle and triangle, Internal name: **ZtreugiZ**,

Name:

Var.:**9.** Group: Day/Mo/Year:

In triangle ABC the angle C is 90 degrees, $\sin A = \frac{6}{7}$, $AC = 5\sqrt{13}$. Find AB.

Answer:

9:[35]

/en/School tasks/The problem of the square equation, Internal name: **ZsumproZ**,

Name:

Var.:**10.** Group: Day/Mo/Year:

The sum of the two numbers is 9.5 and their product is 22. Find these numbers.

Answer:

10:[4, 5.5]

/en/School tasks/Quadratic equation with roots, Internal name: **ZkvurvZ**,

Name:

Var.:**11.** Group: Day/Mo/Year:

$$\frac{\sqrt{8 \cdot x + 12}}{1 - x} = 1$$

Answer:

11:[−1]

/en/School tasks/Function value, Internal name: **ZfuniZ**,

Name:

Var.:**12.** Group: Day/Mo/Year:

$f(x) = x+8$ and $g(x) = 7-x^2$. To find the value $f(g(3)+4)$.

Answer:

12:[10]

/en/School tasks/Max-min on segment 1, Internal name: **Zminmaxi1Z**,

Name:

Var.:**13.** Group: Day/Mo/Year:

Find the largest and the smallest value of the $y = -3 \cdot x + 2$ on the interval $3 \leqslant x \leqslant 15$.

Answer:

13:[(3, −7), (15, −43)]

/en/School tasks/The equation with the module, Internal name: **ZmodZ**,

Name:

Var.:**14.** Group: Day/Mo/Year:

Solve the equation:

$$|\frac{x}{2} + 8| - 15 = 0$$

Answer:

14:[$x_1 = 14$; $x_2 = -46$]

/en/School tasks/The equation with the module is one more, Internal name: **ZmodiZ**,

Name:

Var.:**15.** Group: Day/Mo/Year:

Solve the equation:

$$|x - 7| + 4 = 6$$

Answer:

15:[$x_1 = 9$, $x_2 = 5$]

/en/School tasks/Max-min on segment 2, Internal name: **Zminmaxi2Z**,

Name:

Var.:**16.** Group: Day/Mo/Year:

Find the largest and the smallest value of the $y = x^2 + 6$ on the interval $-6 \leqslant x \leqslant 8$.

Answer:

16:$\left[(0, 6),\ (8, 70)\right]$

/en/School tasks/Quadratic equation, Internal name: **ZurZ**,

Name:

Var.:**17.** Group: Day/Mo/Year:

Solve the equation

$$\frac{2.4 + 7.4 \cdot x}{\sqrt{7.3 \cdot x + 0.4 \cdot x^2}} = 8.7$$

Answer:

17:$\left[21.1054\right]$

/en/School tasks/Fractions, Internal name: **ZdrobiZ**,

Name:

Var.:**18.** Group: Day/Mo/Year:

Write the answer in the form of an irreducible fraction.

$$\frac{\frac{17}{35} - \frac{17}{45}}{\frac{5}{63}} = \frac{(\quad)}{(\quad)}$$

18:$\left[34/25\right]$

/en/School tasks/Interest, Internal name: **ZprocentiZ**,

Name:

Var.:**19.** Group: Day/Mo/Year:

The price was first increased by 41%, and then reduced by 25%. What percentage is the final increase in price?

Answer:

19:$\left[5.75\%\right]$

/en/School tasks/Percent solution Addition, Internal name: **ZpersentAZ**,

Name:

Var.:**20.** Group: Day/Mo/Year:

The solution with a weight of 2100 kg contains 16% salt. How much % salt will there be in solution after adding 1351 kg of water and 49 kg of salt?

Answer:

20:$\left[11\right]$

/en/School tasks/Interest is the Addition of a solution (training), Internal name: **ZpersentAtZ**,

Name:

Var.:**21.** Group: Day/Mo/Year:

Nothing

Answer:

21:$\left[73\right]$

/en/School tasks/Percent Mixing of solutions, Internal name: **ZpersentiZ**,

Name:

Var.:**22.** Group: Day/Mo/Year:

Mixed 5100 pounds 10 percent solution with 500 pounds 66 percent. What has the concentration of the solution become?

Answer:

22:$\left[15\%\right]$

/en/School tasks/Percent Mixing of solutions (complex), Internal name: **ZpersentiiZ**,

Name:

Var.:**23.** Group: Day/Mo/Year:

How many kilograms of 43 percent solution must be mixed with 500 kg 62 percent solution for getting 48 percent solution?

Answer:

23:$\left[1400\text{kg}\right]$

/en/School tasks/Equation with logarithms, Internal name: **ZurlogZ**,

Name:

Var.:**24.** Group: Day/Mo/Year:

Solve the equation::

$$5^{2 \cdot \log_5 x} + 6 \cdot \log_5 \left(\frac{5^x}{25}\right) - 15 = 0$$

Answer:

24:$\left[x = 3\right]$

/en/School tasks/Simple equation with logarithm, Internal name: **ZurlogiZ**,

Name:

Var.:**25.** Group: Day/Mo/Year:

Solve the equation:

$$\log_{16} \frac{x + 14}{x + 5} = \frac{1}{4}$$

Answer:

25:$\left[x = 4\right]$

/en/School tasks/Inequality, Internal name: **ZneriZ**,

Name:

Var.:**26.** Group: Day/Mo/Year:

Solve the inequality:

$$\frac{1}{x - 3} \leqslant \frac{1}{8}$$

Answer:

26:$\left[(-\infty; 3) \cup [11; \infty)\right]$

/en/School tasks/The inequality is simple, Internal name: **ZneriiZ**,

Name:

Var.:**27.** Group: Day/Mo/Year:

Find the smallest integer solution of the inequality:

$$\frac{1}{x-7} < \frac{1}{-5}$$

Answer:

27:[3]

2 Geometry.

/en/Geometry/The intersection of straight and plane, Internal name: **ZplZ**,

Name:

Var.:**28.** Group: Day/Mo/Year:

Find the coordinates of the point of intersection of the plane passing through the point $A = (-1; -4; 1)$, $B = (7; -8; 3)$, $C = (-4; -2; 0)$ with the line passing through the point $D = (10; -9; 2)$, $E = (19; -18; 11)$.

Answer:

28:[(13; −12; 5)]

/en/Geometry/The intersection of straight line and plane (training), Internal name: **ZpltZ**,

Name:

Var.:**29.** Group: Day/Mo/Year:

Find the equation of the plane lying on the points $A = (4; 1; -1)$, $B = (12; -5; 3)$, $C = (3; 2; -2)$ and write it:

Find the parametric equation of the line passing through the point $D = (-19; 17; -13)$ and $E = (-5; 10; -6)$.

$$\begin{cases} x = & + & \cdot t \\ y = & + & \cdot t \\ z = & + & \cdot t \end{cases}$$

Find the coordinates of the point of intersection of this plane with this line.

Answer:

29:[(−13; 14; −10)]

/en/Geometry/Intersection of straight line and plane (with check), Internal name: **ZplttZ**,

Name:

Var.:**30.** Group: Day/Mo/Year:

empty

30:[(−22; 7; 9)]

/en/Geometry/The image of a point on the line, Internal name: **ZprlineZ**,

Name:

Var.:**31.** Group: Day/Mo/Year:

Find the coordinates of the projection of the point $A = (-2, -2, -4)$ on the line passing through the points $B = (-1, 3, 2)$ and $C = (0, 6, 3)$.

Answer:

31:[(−3, −3, 0)]

/en/Geometry/Symmetrical point with respect to a straight line, Internal name: **ZsmlineZ**,

Name:

Var.:**32.** Group: Day/Mo/Year:

Find the coordinates of the point that is symmetric to the point $A = (-1, 2, -1)$ relative to the line passing through the points $B = (1, -3, -1)$ and $C = (4, -7, 0)$.

Answer:

32:[(−3, 0, −3)]

/en/Geometry/The projection of a point on the plane, Internal name: **ZprplZ**,

Name:

Var.:**33.** Group: Day/Mo/Year:

Find the coordinates of the projection of the point $A = (2, -8, -1)$ on the plane given by the equation $-1 \cdot x + 3 \cdot y - 1 \cdot z - 8 = 0$.

Answer:

33:$\big[(-1, 1, -4)\big]$

/en/Geometry/Symmetrical point with respect to the plane, Internal name: **ZsmplZ**,

Name:

Var.:**34.** Group: Day/Mo/Year:

Find the coordinates of the point, the symmetric point $A = (-3, 5, 5)$ relative to the plane given by the equation $2 \cdot x - 3 \cdot y - 1 \cdot z + 12 = 0$.

Answer:

34:$\big[(1, -1, 3)\big]$

/en/Geometry/The intersection of lines on the plane, Internal name: **ZprprZ**,

Name:

Var.:**35.** Group: Day/Mo/Year:

The first line passes through the points $A = (0, -5)$ and $B = (-1, -8)$. The second line passes through the points $C = (5, 8)$ and $D = (6, 10)$. Find the coordinates of the intersection point of these lines.

Answer:

35:$\big[(3, 4)\big]$

/en/Geometry/The intersection of lines on the plane (complex), Internal name: **ZprprxZ**,

Name:

Var.:**36.** Group: Day/Mo/Year:

The first line passes through the points $A = (-10, 6)$ and $B = (-4, 7)$. The second line passes through the points $C = (14, 4)$ and $D = (19, 5)$. Find the coordinates of the intersection point of these lines.

Answer:

36:$\big[(194, 40)\big]$

/en/Geometry/The intersection of lines on the plane (with fractional numbers), Internal name: **ZprprvZ**,

Name:

Var.:**37.** Group: Day/Mo/Year:

The first line passes through the points $A = (-8; -4)$ and $B = (-17; -1)$. The second line passes through the points $C = (1; 4)$ and $D = (-3; 3)$. Find the coordinates of the intersection point of these lines. (Tip: the answer will contain fractional numbers)

Answer:

37:$\big[(\frac{-125}{7}; \frac{-5}{7}) \approx (-17.857; -0.714)\big]$

/en/Geometry/The intersection of straight lines on the plane (training), Internal name: **ZuprprZ**,

Name:

Var.:**38.** Group: Day/Mo/Year:

Given four points: $A = (-13, -5)$, $B = (-5, -7)$, $C = (15, -3)$ and $D = (22, -5)$. Find:
(1) The coordinates of the vector $\vec{AB} = (\quad ; \quad)$,
(2) parametric equation of the line passing through the points A and B: $\begin{cases} x = & + & \cdot t_1 \\ y = & + & \cdot t_1 \end{cases}$
(3) The coordinates of the vector $\vec{CD} = (\quad ; \quad)$,
(4) parametric equation of the line passing through the points C and D: $\begin{cases} x = & + & \cdot t_2 \\ y = & + & \cdot t_2 \end{cases}$
(5) the coordinates of the intersection of these lines $(\quad ; \quad)$.

38:$\big[(267, -75)\big]$

/en/Geometry/The intersection of lines in space, Internal name: **ZprprprZ**,

Name:

Var.:**39.** Group: Day/Mo/Year:

The first line passes through the points $A = (-3, -4, 0)$ and $B = (-3, -5, -1)$. The second line passes through the points $C = (-7, -3, -7)$ and $D = (-8, -3, -9)$. Find the coordinates of the intersection point of these lines.

Answer:

39:$\big[(-3, -3, 1)\big]$

/en/Geometry/The intersection of straight lines in space (training), Internal name: **ZprprprtZ**,

Name:

Var.:**40.** Group: Day/Mo/Year:

Given four points: $A = (3, 15, -9)$, $B = (3, 18, -11)$, $C = (3, 11, -5)$ and $D = (3, 13, -6)$. Find:
(1) The coordinates of the vector $\vec{AB} = (\quad ; \quad ; \quad)$,
(2) parametric equation of the line passing through the points A and B: $\begin{cases} x = & + & \cdot\alpha \\ y = & + & \cdot\alpha \\ z = & + & \cdot\alpha \end{cases}$
(3) The coordinates of the vector $\vec{CD} = (\quad ; \quad ; \quad)$,
(4) parametric equation of the line passing through the points C and D: $\begin{cases} x = & + & \cdot\beta \\ y = & + & \cdot\beta \\ z = & + & \cdot\beta \end{cases}$
(5) the coordinates of the intersection of these lines $(\quad ; \quad ; \quad)$.

40:$\big[(3, 3, -1)\big]$

/en/Geometry/The intersection of straight lines in space (more training), Internal name: **ZprprprtvZ**,

Name:

Var.:**41.** Group: Day/Mo/Year:

Given four points: $A = (7, -1, -6)$, $B = (10, 0, -7)$, $C = (-5, -4, 3)$ and $D = (-6, -4, 5)$. Find:
(1) The coordinates of the vector $\vec{AB} = (\quad ; \quad ; \quad)$,
(2) parametric equation of the line passing through the points A and B: $\begin{cases} x = & + & \cdot\alpha \\ y = & + & \cdot\alpha \\ z = & + & \cdot\alpha \end{cases}$
(3) The coordinates of the vector $\vec{CD} = (\quad ; \quad ; \quad)$,
(4) parametric equation of the line passing through the points C and D: $\begin{cases} x = & + & \cdot\beta \\ y = & + & \cdot\beta \\ z = & + & \cdot\beta \end{cases}$
(5) Equate x, y, z from the first equation of the line to x, y, z from the second equation of the line:
$\begin{cases} + & \cdot\alpha = & + & \cdot\beta \\ + & \cdot\alpha = & + & \cdot\beta \\ + & \cdot\alpha = & + & \cdot\beta \end{cases}$
(6) Solve this system of equations and find the values of $\alpha = (\quad)$ and $\beta = (\quad)$.
(7) Substitute the value of α in the first equation of the line and find the values of $x = (\quad)$, $y = (\quad)$ and $z = (\quad)$.
(8) Substitute the value of β in the first equation of the line and find the values of $x = (\quad)$, $y = (\quad)$ and $z = (\quad)$.
(9) Find the coordinates of the intersection of these lines: $(\quad ; \quad ; \quad)$.

41: $[(-2, -4, -3)]$

3 Geometry (simple).

/en/Geometry (simple)/Straight line on plane, Internal name: **ZoburiZ**,

Name:

Var.:**42.** Group: Day/Mo/Year:

Find: (1) the General equation of the line passing through the point $A = (-4, -9)$ perpendicular to the vector $\vec{\alpha} = (21, 28)$..
(2) Find the distance from this line to the point $B = (-6, 5)$.
(3) Write the equation of this line as $y = k \cdot x + b$.

Answer:

42: $[21 \cdot x + 28 \cdot y + 336 = 0,\ d = 10,\ y = \frac{-3}{4} \cdot x - 12]$

/en/Geometry (simple)/Straight line and two points of the plane, Internal name: **ZlinedotsZ**,

Name:

Var.:**43.** Group: Day/Mo/Year:

Find relationship a/b if it is known that a straight line $a \cdot x + b \cdot y + c = 0$ passes through points with coordinates $(-4; 20)$ and $(-1; 8)$.

Answer:

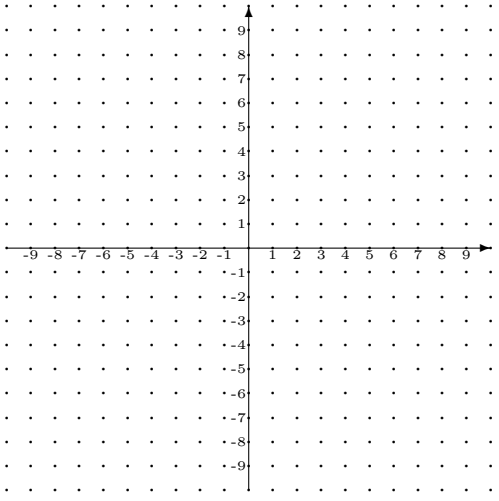
43: $[a/b = 4,$ (-12 -3 12)$]$

/en/Geometry (simple)/Three straight lines, Internal name: **ZtriprZ**,

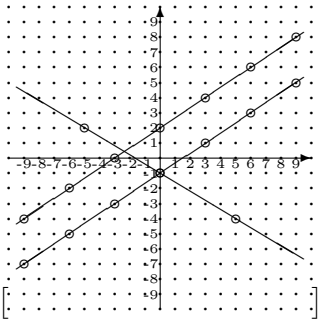
Name:

Var.:**44.** Group: Day/Mo/Year:

Draw lines defined by equations:
1) $y = \frac{2}{3} \cdot x - 1$
2) $y = \frac{-3}{5} \cdot x - 1$
3) $y = \frac{2}{3} \cdot x + 2$.



44: [ ]

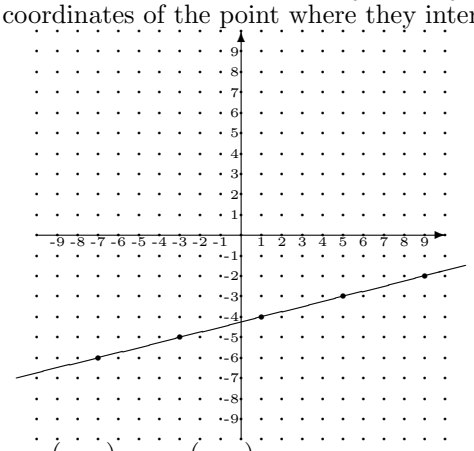


/en/Geometry (simple)/Two straight lines, Internal name: **ZdveprZ**,

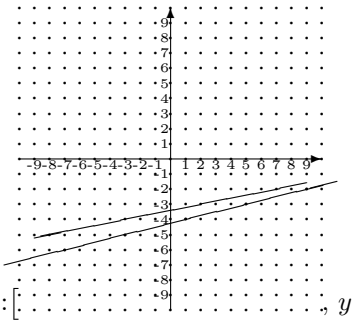
Name:

Var.:**45.** Group: Day/Mo/Year:

Find the equation of the drawn line.
Draw a line given by the equation $y = \frac{1}{5} \cdot x + \frac{-17}{5}$
Find the coordinates of the point where they intersect.



Answer: $y = \frac{(\quad)}{(\quad)} \cdot x + \frac{(\quad)}{(\quad)}$, intersect in: (,).



45: $\big[$, $y = \frac{1}{4} \cdot x + \frac{-17}{4}$, $(17, 0)\big]$

/en/Geometry (simple)/The vertices of a parallelogram on a plane, Internal name: **Zparallelogram2Z**,

Name:

Var.:**46.** Group: Day/Mo/Year:

Find the coordinates of all the vertices of the parallelogram, if you know the coordinates of one vertex $A = (-2, 22)$ and the equation of its two sides: $-8 \cdot x + 5 \cdot y = 24$ and $-6 \cdot x - 9 \cdot y + 84 = 0$.

Answer:

46: $\big[(7, 16),\ (-7, 14),\ (2, 8)\big]$

/en/Geometry (simple)/Perpendicular line, Internal name: **ZperppriamZ**,

Name:

Var.:**47.** Group: Day/Mo/Year:

The line is given by the $y = \frac{5}{6} \cdot x - \frac{1}{6}$ equation
(1) Write the General equation of this line,
(2) find the equation of a perpendicular line passing through the point $(-11, 11)$,
(3) find the point of intersection of these lines.

Answer:

47: $\big[(-1, -1)\big]$

/en/Geometry (simple)/The top of the square, Internal name: **ZkvadratiZ**,

Name:

Var.:**48.** Group: Day/Mo/Year:

Find the coordinates of the vertices of a square, if you know the coordinates of one vertex $(14, 11)$ and the equation of one side $y = \frac{-1}{7} \cdot x + \frac{41}{7}$.

Answer:

48: $\big[(13, 4),\ (6, 5),\ (7, 12)$ or $(20, 3),\ (21, 10)\big]$

/en/Geometry (simple)/Distance from point to plane, Internal name: **ZploskitochZ**,

Name:

Var.:**49.** Group: Day/Mo/Year:

Find the distance from the point $A = (7, 8, -9)$ to the plane passing through the point $B = (-6, -8, -8)$ perpendicular to the vector $\vec{\alpha} = (2, -4, 4)$.

Answer:

49: $\big[7\big]$

/en/Geometry (simple)/Is the point on the plane, Internal name: **ZdotonplZ**,

Name:

Var.:**50.** Group: Day/Mo/Year:

At what value of z the point $(4; 5; z)$ lies on the plane $7 \cdot x + 5 \cdot y - 5 \cdot z - 43 = 0$?

Answer:

50: $\big[2\big]$

/en/Geometry (simple)/Vector is parallel to plane, Internal name: **ZvekparalplZ**,

Name:

Var.:**51.** Group: Day/Mo/Year:

At what value of z the vector $(3; 1; z)$ is parallel to the plane $3 \cdot x - 6 \cdot y - 1 \cdot z + 1 = 0$?

Answer:

51: $\big[3\big]$

/en/Geometry (simple)/The point of intersection of altitudes in a triangle, Internal name: **ZvysintreugZ**,

Name:

Var.:**52.** Group: Day/Mo/Year:

The coordinates of two vertices of the triangle are given $(-14; 8)$, $(11; 33)$ and the points of intersection of heights $(5; 15)$. Find the coordinates of the third vertex of the triangle.

Answer:

52: $\big[(25; -5)\big]$

4 Geometry (complex).

/en/Geometry (complex)/Two vertices of a square, Internal name: **ZkvadratZ**,

Name:

Var.:**53.** Group: Day/Mo/Year:

Two opposite vertices of square $A = (5, 33, 22)$, $C = (-13, -31, -26)$ and point $E = (19, -22, -50)$ lying in the same plane as the square are given. Find the coordinates of the two remaining vertices.

Answer:

53: $\big[(28, 10, -26),\ (-36, -8, 22)\big]$

/en/Geometry (complex)/Three lines, Internal name: **ZtrilineZ**,

Name:

Var.:**54.** Group: Day/Mo/Year:

The first line passes through points with coordinates $(1, 3, 1)$ and $(4, 0, 1)$. The second line passes through the points with coordinates $(0, -3, -3)$ and $(0, -12, -9)$. The third line passes through the point with coordinates $(1, -2, -2)$ and crosses the first and second lines. Find the coordinates of the point of intersection of the first and third lines.

Answer:

54: $\big[(2, 2, 1),\ (0, -6, -5)\big]$

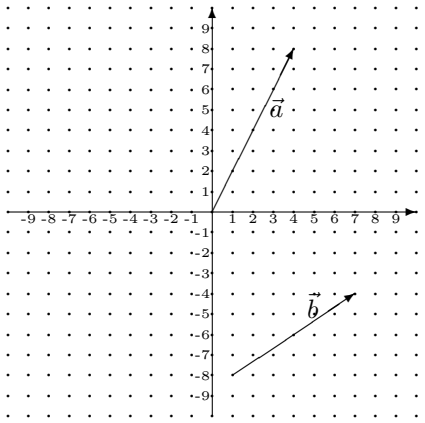
5 Vectors.

/en/Vectors/Sum of vectors, Internal name: **ZsumvektZ**,

Name:

Var.:**55.** Group: Day/Mo/Year:

Find the coordinates of the vector $(2 \cdot \vec{a} + \vec{b})$.



Answer:

55: $\big[(14, 20)\big]$

/en/Vectors/Vector of given length and direction 2, Internal name: **ZvektIdir2Z**,

Name:

Var.:**56.** Group: Day/Mo/Year:

The vector $\vec{CD}$ is directed in the same direction as the vector $\vec{AB}$ and the vector length $\vec{CD}$ is $\sqrt{1025}$. Find the coordinates of D if $A = (-3, 9)$, $B = (-7, 4)$ and $C = (8, -9)$.

Answer:

56: $\big[(-12, -34)\big]$

/en/Vectors/Vector of given length and direction 3, Internal name: **ZvektIdir3Z**,

Name:

Var.:**57.** Group: Day/Mo/Year:

The vector $\vec{CD}$ is directed in the same direction as the vector $\vec{AB}$ and the vector length $\vec{CD}$ is $\sqrt{272}$. Find the coordinates of D if $A = (1, 7, 4)$, $B = (-1, 10, 2)$ and $C = (-8, -5, 9)$.

Answer:

57: $\big[(-16, 7, 1)\big]$

/en/Vectors/The fourth vertex of the parallelogram, Internal name: **ZparalZ**,

Name:

Var.:**58.** Group: Day/Mo/Year:

The coordinates of three vertices of the parallelogram are given: $A = (-4, -2)$, $B = (-7, -7)$ and $D = (-6, 1)$. Find the coordinates of the fourth vertex C.

Answer:

58: $\big[$For ABCD: $(-9, -4)$, For ABDC: $(-3, 6)\big]$

/en/Vectors/The fourth vertex of the parallelogram in space, Internal name: **Zparal3Z**,

Name:

Var.:**59.** Group: Day/Mo/Year:

The coordinates of three vertices of the parallelogram are given: $A = (2, 2, -4)$, $B = (7, 1, -7)$ and $D = (3, -3, -9)$. Find the coordinates of the fourth vertex C.

Answer:

59:[For ABCD: $(8, -4, -12)$, For ABDC: $(-2, -2, -6)$]

/en/Vectors/Two vertices of a square, Internal name: **Zverkvadr Z**,

Name:

Var.:**60.** Group: Day/Mo/Year:

Two adjacent vertices of a square are given: $(-4; 5)$ and $(41; -42)$. Find the coordinates of the remaining vertices.

Answer:

60:[$(88; 3)$, $(43; 50)$ and $(-6; -87)$, $(-51; -40)$]

/en/Vectors/Division of the segment in relation to the 2-dimensional case, Internal name: **Zdelotr2Z**,

Name:

Var.:**61.** Group: Day/Mo/Year:

The coordinates of two points $A = (49, 42)$ and $B = (174, 112)$ are given. Find the coordinates of the point C, which lies on the segment AB and divides it so that $|AC| : |CB| = 3 : 2$.

Answer:

61:[$(124, 84)$]

/en/Vectors/Division of the segment in relation to the 3-dimensional case, Internal name: **Zdelotr3Z**,

Name:

Var.:**62.** Group: Day/Mo/Year:

The coordinates of two points $A = (-35, 41, -38)$ and $B = (53, -43, 58)$ are given. Find the coordinates of the point C, which lies on the segment AB and divides it so that $|AC| : |CB| = 3 : 1$.

Answer:

62:[$(31, -22, 34)$]

/en/Vectors/Division of a segment in relation to (training), Internal name: **Zdelotr4Z**,

Name:

Var.:**63.** Group: Day/Mo/Year:

Nothing

Answer:

63:[$(86, -82)$]

/en/Vectors/Simple scalar product, Internal name: **ZskalpriZ**,

Name:

Var.:**64.** Group: Day/Mo/Year:

Find the scalar product of the vector $(-2; 3)$ with the vector $(3; 4)$.

Answer:

64:[6]

/en/Vectors/Vector orthogonal to the given, Internal name: **ZortiZ**,

Name:

Var.:**65.** Group: Day/Mo/Year:

Find a number z that the vector $(-7, 4, 1)$ is perpendicular to the vector $(-2, 5, z)$.

Answer:

65:[-34]

/en/Vectors/Vector orthogonal to two data (with length), Internal name: **ZortiiZ**,

Name:

Var.:**66.** Group: Day/Mo/Year:

Find the coordinates of the vector $\vec{a}$, which is orthogonal to the vectors $\vec{b} = (-9, -3, -7)$ and $\vec{c} = (-3, -6, 1)$ and has a length of $\sqrt{88}$.

Answer:

66:[$\pm(6, -4, -6)$]

/en/Vectors/Vector orthogonal to two given, Internal name: **ZortvZ**,

Name:

Var.:**67.** Group: Day/Mo/Year:

Find a non-zero vector perpendicular to the vector $(5, -2, 1)$ and perpendicular to the vector $(-6, 1, -1)$.

Answer:

67:[$\lambda \cdot (1, -1, -7)$]

/en/Vectors/Vector orthogonal to two data (training), Internal name: **ZortvtZ**,

Name:

Var.:**68.** Group: Day/Mo/Year:

1) Find two different solutions to a system of linear equations: $\begin{cases} 16 \cdot x - 2 \cdot y - 1 \cdot z = 0 \\ 9 \cdot x - 1 \cdot y - 1 \cdot z = 0 \end{cases}$

2) Find a non-zero vector perpendicular to the vector $(16, -2, -1)$ and perpendicular to the vector $(9, -1, -1)$.

Answer:

68:[$\lambda \cdot (1, 7, 2)$]

/en/Vectors/Scalar product, Internal name: **ZproizZ**,

Name:

Var.:**69.** Group: Day/Mo/Year:

The coordinates of vectors $\vec{a}$, $\vec{b}$ in an orthonormal basis are given: $\vec{a} = (-1, -1)$, $\vec{b} = (1, 0)$. The coordinates of $\vec{c}$, $\vec{d}$ in the basis $\vec{a}, \vec{b}$ are given: $\vec{c} = (-1, -1)$, $\vec{d} = (3, 3)$.
Find the scalar product of the vector $\vec{c}$ with vector $\vec{d}$.

Answer:

69: $[-3]$

/en/Vectors/Coordinates in another basis, Internal name: **ZdotZ**,

Name:

Var.:**70.** Group: Day/Mo/Year:

Given the coordinates of the points A, B, C, D, E in Cartesian coordinate system: $A = (2, 3)$, $B = (6, 4)$, $C = (9, 4)$, $D = (3, 3)$, $E = (17, 5)$. Find the coordinates of E in the new coordinate system with the origin at D and the base vectors $\vec{AB}$ and $\vec{BC}$.

Answer:

70: $[(2, 2)]$

/en/Vectors/Area of a triangle on a plane, Internal name: **ZploshZ**,

Name:

Var.:**71.** Group: Day/Mo/Year:

Find the area of the triangle, the coordinates of the vertices of which is $(1, 7)$, $(-5, 11)$ and $(6, 12)$.

Answer:

71: $[25]$

6 Algebra.

/en/Algebra/SLEQ is a very simple 2x2, Internal name: **Zslu22Z**,

Name:

Var.:**72.** Group: Day/Mo/Year:

$$\begin{cases} 8 \cdot x - 1 \cdot y = 26 \\ -4 \cdot x + 1 \cdot y = -10 \end{cases}$$

Answer:

72: $[x = 4,\ y = 6]$

/en/Algebra/SLEQ is a very simple 3x3, Internal name: **Zslu33Z**,

Name:

Var.:**73.** Group: Day/Mo/Year:

$$\begin{cases} +1 \cdot y = -2 \\ -1 \cdot x + 1 \cdot y + 1 \cdot z = 2 \\ +1 \cdot z = 3 \end{cases}$$

Answer:

73: $[x = -1,\ y = -2,\ z = 3]$

/en/Algebra/SLEQ 3x3 with one solution, Internal name: **Zslu33mZ**,

Name:

Var.:**74.** Group: Day/Mo/Year:

$$\begin{cases} 5 \cdot x - 5 \cdot y - 7 \cdot z = 24 \\ -3 \cdot x + 4 \cdot y + 5 \cdot z = -15 \\ 3 \cdot x - 3 \cdot y - 4 \cdot z = 14 \end{cases}$$

Answer:

74: $[x = 3,\ y = 1,\ z = -2]$

/en/Algebra/SLEQ 3-unknowns 4-equations one solution, Internal name: **ZsluZ**,

Name:

Var.:**75.** Group: Day/Mo/Year:

$$\begin{cases} 6 \cdot x_1 - 3 \cdot x_2 + 5 \cdot x_3 = 35 \\ -3 \cdot x_1 + 2 \cdot x_2 - 2 \cdot x_3 = -14 \\ -3 \cdot x_1 + 1 \cdot x_2 - 2 \cdot x_3 = -17 \\ -2 \cdot x_1 + 2 \cdot x_2 - 2 \cdot x_3 = -10 \end{cases}$$

Answer:

75: $[x_1 = 4,\ x_2 = 3,\ x_3 = 4]$

/en/Algebra/SLEQ 4-unknown, 5-equation, one solution, Internal name: **ZsluuZ**,

Name:

Var.:**76.** Group: Day/Mo/Year:

$$\begin{cases} +1 \cdot x_3 - 1 \cdot x_4 = -4 \\ -1 \cdot x_1 - 4 \cdot x_2 - 3 \cdot x_3 + 1 \cdot x_4 = 3 \\ -1 \cdot x_1 - 5 \cdot x_2 - 4 \cdot x_3 = 2 \\ 1 \cdot x_1 + 2 \cdot x_2 + 1 \cdot x_3 = 1 \\ 1 \cdot x_1 + 5 \cdot x_2 + 5 \cdot x_3 = -4 \end{cases}$$

Answer:

76: $[x_1 = 1,\ x_2 = 1,\ x_3 = -2,\ x_4 = 2]$

/en/Algebra/SLEQ with multiple solutions, Internal name: **ZsluiZ**,

Name:

Var.:**77.** Group: Day/Mo/Year:

Find five different solutions to the system of equations:

$$\begin{cases} 1\cdot x_1 +1\cdot x_2 -3\cdot x_3 = 0 \\ 1\cdot x_1 +2\cdot x_2 -5\cdot x_3 = 0 \end{cases}$$

Answer:

77: $\left[(1x_3, 2x_3, x_3)\right]$

/en/Algebra/SLEQ 3x3 with multiple solutions, Internal name: **Zsluii3Z**,

Name:

Var.:**78.** Group: Day/Mo/Year:

Find five different solutions to the system of equations:

$$\begin{cases} 3\cdot x_1 -1\cdot x_2 +7\cdot x_3 = 3 \\ -2\cdot x_1 +2\cdot x_2 -2\cdot x_3 = -2 \\ 2\cdot x_1 -1\cdot x_2 +4\cdot x_3 = 2 \end{cases}$$

Answer:

78: $\left[\text{Formula to verify the solution: } (1-3x_3, -2x_3, x_3)\right]$

/en/Algebra/SLEQ 4x4 with multiple solutions, Internal name: **Zsluii4Z**,

Name:

Var.:**79.** Group: Day/Mo/Year:

Find five different solutions to the system of equations:

$$\begin{cases} 4\cdot x_1 -3\cdot x_2 +1\cdot x_3 +7\cdot x_4 = 4 \\ -3\cdot x_1 +1\cdot x_2 -1\cdot x_3 -8\cdot x_4 = -3 \\ 7\cdot x_1 -6\cdot x_2 +3\cdot x_3 +12\cdot x_4 = 7 \\ 4\cdot x_1 -3\cdot x_2 +2\cdot x_3 +8\cdot x_4 = 4 \end{cases}$$

Answer:

79: $\left[\text{Formula to verify the solution: } (1-3x_4, -2x_4, -1x_4, x_4)\right]$

/en/Algebra/SLEQ 3-unknowns 4-equation of one-dimensional space solutions, Internal name: **ZsluuuZ**,

Name:

Var.:**80.** Group: Day/Mo/Year:

Find the General solution of the system of equations:

$$\begin{cases} 2\cdot x_1 -1\cdot x_2 +1\cdot x_3 -2\cdot x_4 = 0 \\ -1\cdot x_1 +2\cdot x_2 -1\cdot x_3 +4\cdot x_4 = 0 \\ 2\cdot x_1 -3\cdot x_2 +2\cdot x_3 -5\cdot x_4 = 0 \\ -1\cdot x_1 +2\cdot x_2 -1\cdot x_3 +4\cdot x_4 = 0 \end{cases}$$

Answer:

80: $\left[(1, -3, -3, 1)\cdot\lambda\right]$

/en/Algebra/SLEQ with two-dimensional solution space, Internal name: **ZsluiiiZ**,

Name:

Var.:**81.** Group: Day/Mo/Year:

Find two linearly independent solutions.

$$\begin{cases} 5\cdot x_1 +1\cdot x_2 -11\cdot x_3 +11\cdot x_4 = 0 \\ -4\cdot x_1 -1\cdot x_2 +9\cdot x_3 -9\cdot x_4 = 0 \\ 2\cdot x_1 +1\cdot x_2 -5\cdot x_3 +5\cdot x_4 = 0 \end{cases}$$

Answer:

81: $\left[(2x_3 - 2x_4,\ 1x_3 - 1x_4,\ x_3, x_4)\right]$

/en/Algebra/New 2x2 SLEQ, Internal name: **Znslu22Z**,

Name:

Var.:**82.** Group: Day/Mo/Year:

$$\begin{cases} -20\cdot x -9\cdot y = -21 \\ -11\cdot x -5\cdot y = -12 \end{cases}$$

Answer:

82: $\left[x = -3;\ y = 9\right]$

/en/Algebra/New 2x3 SLEQ, Internal name: **Znslu23Z**,

Name:

Var.:**83.** Group: Day/Mo/Year:

$$\begin{cases} 20\cdot x -27\cdot y = 5 \\ -2\cdot x +3\cdot y = 1 \\ -19\cdot x +26\cdot y = -3 \end{cases}$$

Answer:

83: $\left[x = 7;\ y = 5\right]$

/en/Algebra/New 3x3 SLEQ, Internal name: **Znslu33Z**,

Name:

Var.:**84.** Group: Day/Mo/Year:

$$\begin{cases} x -3\cdot y -2\cdot z = -1 \\ -x +5\cdot y +3\cdot z = 8 \\ x -2\cdot y -z = 1 \end{cases}$$

Answer:

84: $\left[x = 8;\ y = 5;\ z = -3\right]$

/en/Algebra/New 3x4 SLEQ, Internal name: **Znslu34Z**,

Name:

Var.:**85.** Group: Day/Mo/Year:

$$\begin{cases} x -y -z = 1 \\ -x +2\cdot y +2\cdot z = -1 \\ -2\cdot x +3\cdot y +3\cdot z = -2 \\ -2\cdot x +3\cdot y +4\cdot z = -1 \end{cases}$$

Answer:

85: $\left[x = 1;\ y = -1;\ z = 1\right]$

/en/Algebra/New 5x5 SLEQ, Internal name: **Znslu55Z**,

Name:

Var.:**86.** Group: Day/Mo/Year:

$$\begin{cases} 3\cdot x_1 - x_2 - x_3 - x_4 - x_5 = 1 \\ 5\cdot x_1 - x_2 - 3\cdot x_3 - 2\cdot x_4 - x_5 = -1 \\ 10\cdot x_1 - 3\cdot x_2 - 6\cdot x_3 - 4\cdot x_4 - 3\cdot x_5 = 7 \\ -10\cdot x_1 + 2\cdot x_2 + 7\cdot x_3 + 4\cdot x_4 + 2\cdot x_5 = -1 \\ -14\cdot x_1 + 3\cdot x_2 + 10\cdot x_3 + 6\cdot x_4 + 4\cdot x_5 = -8 \end{cases}$$

Answer:

86: $\left[x_1 = -3;\ x_2 = -4;\ x_3 = -3;\ x_4 = 2;\ x_5 = -5\right]$

/en/Algebra/New 5x6 SLEQ, Internal name: **Znslu56Z**,

Name:

Var.:**87.** Group: Day/Mo/Year:

$$\begin{cases} -3\cdot x_1 + 3\cdot x_2 - 2\cdot x_3 + 3\cdot x_4 - 4\cdot x_5 = -20 \\ -6\cdot x_1 + 7\cdot x_2 - x_3 + 7\cdot x_4 - 4\cdot x_5 = -44 \\ 3\cdot x_1 - 4\cdot x_2 - x_3 - 3\cdot x_4 - x_5 = 15 \\ -3\cdot x_1 + 4\cdot x_2 + 2\cdot x_3 + 5\cdot x_4 + x_5 = -26 \\ 2\cdot x_1 - 2\cdot x_2 + 2\cdot x_3 - x_4 + 3\cdot x_5 = 9 \\ -2\cdot x_1 + 3\cdot x_2 + x_3 + 3\cdot x_4 + x_5 = -14 \end{cases}$$

Answer:

87: $\left[x_1 = -7;\ x_2 = -8;\ x_3 = -9;\ x_4 = -1;\ x_5 = 8\right]$

/en/Algebra/SLEQ with fractions, Internal name: **ZsludZ**,

Name:

Var.:**88.** Group: Day/Mo/Year:

Find the solution of the system of equations and write the answer in the form of irreducible fractions.

$$\begin{cases} \frac{5}{7}\cdot x + \frac{1}{2}\cdot y = \frac{-17}{28} \\ \frac{1}{4}\cdot x - \frac{2}{7}\cdot y = \frac{-31}{70} \end{cases}$$

Answer: $x = \frac{(\quad)}{(\quad)}, y = \frac{(\quad)}{(\quad)}$.

88: $\left[x = \frac{-6}{5},\ y = \frac{1}{2}.\right]$

7 higher algebra.

/en/higher algebra/Actions with complex numbers, Internal name: **ZcompliZ**,

Name:

Var.:**89.** Group: Day/Mo/Year:

$(5 + 4\cdot i)\cdot(1 - i) + (-2 + 4\cdot i) = x + 3\cdot i$

$x =$

89: $\left[7\right]$

/en/higher algebra/Division of complex numbers, Internal name: **ZdelcomplZ**,

Name:

Var.:**90.** Group: Day/Mo/Year:

$\frac{-6 + 22\cdot i}{1 + 5\cdot i} =$

90: $\left[4 + 2\cdot i\right]$

/en/higher algebra/The square root of a complex number, Internal name: **ZsqrtCZ**,

Name:

Var.:**91.** Group: Day/Mo/Year:

$\sqrt{-48 + 14\cdot i} =$

91: $\left[-1 - 7\cdot i;\ 1 + 7\cdot i\right]$

/en/higher algebra/Ordinary square with negative discriminant, Internal name: **ZkvursZ**,

Name:

Var.:**92.** Group: Day/Mo/Year:

To find the roots of the equation
$x^2 + 2\cdot x + 10 = 0$.

Answer:

92: $\left[-1 \pm 3\cdot i\right]$

/en/higher algebra/Square equation with complex numbers, Internal name: **ZkvurZ**,

Name:

Var.:**93.** Group: Day/Mo/Year:

To find the roots of the equation:
$(1 - 1\cdot i)\cdot x^2 + (5 - 3\cdot i)\cdot x + (10) = 0$

Answer:

93: $\left[-3 + 1\cdot i,\ -1 - 2\cdot i;\right]$

/en/higher algebra/Square equation with complex numbers (homogeneous), Internal name: **ZkvurrrZ**,

Name:

Var.:**94.** Group: Day/Mo/Year:

To find the roots of the equation:
$x^2 + (4 + 3\cdot i)\cdot x + (1 + 5\cdot i) = 0$

Answer:

94: $\left[-1 - 1\cdot i,\ -3 - 2\cdot i;\right]$

/en/higher algebra/Square equation with complex numbers (with simple discriminant), Internal name: **ZkvurrZ**,

Name:

Var.:**95.** Group: Day/Mo/Year:

To find the roots of the equation:
$(1-1\cdot i)\cdot x^2+(2+8\cdot i)\cdot x+(-11-3\cdot i)=0$

Answer:

95:$\left[2-3\cdot i,\ 1-2\cdot i;\right]$

/en/higher algebra/Rational roots of polynomials, Internal name: **Zratroot3Z**,

Name:

Var.:**96.** Group: Day/Mo/Year:

Find all the roots of the polynomial $9\cdot x^3+12\cdot x^2-80\cdot x+64$ and determine their multiplicity.

Answer:

96:$\left[\frac{4}{3};k=2,\ -4;k=1\right]$

/en/higher algebra/Inverse polynomial, Internal name: **ZobrPolZ**,

Name:

Var.:**97.** Group: Day/Mo/Year:

Find $(3\cdot x^2+9\cdot x+7)^{-1}$ in the ring factor $P[x]/(-9\cdot x^3-33\cdot x^2-36\cdot x-11)$.

Answer:

97:$\left[-3\cdot x^2-8\cdot x-3\right]$

/en/higher algebra/Inverse polynomial (with hint), Internal name: **ZobrPoltZ**,

Name:

Var.:**98.** Group: Day/Mo/Year:

Find $(3\cdot x^2-12\cdot x+10)^{-1}$ in the ring factor $P[x]/(-9\cdot x^3+27\cdot x^2+5\cdot x-27)$.
Hint: $(-9\cdot x^3+27\cdot x^2+5\cdot x-27)\cdot(3\cdot x-3)+(3\cdot x^2-12\cdot x+10)\cdot(9\cdot x^2-8)=1$.

Answer:

98:$\left[9\cdot x^2-8\right]$

/en/higher algebra/Symmetric polynomials, Internal name: **ZsympoliZ**,

Name:

Var.:**99.** Group: Day/Mo/Year:

Express the polynomial $-2\cdot x_2^2x_3^3-2\cdot x_1^2x_2^3-2\cdot x_1^3x_2^2-11\cdot x_1^2x_2^2x_3-2\cdot x_1x_2x_3^3-2\cdot x_1x_2^3x_3-2\cdot x_1^2x_3^3-11\cdot x_1^2x_2x_3^2-2\cdot x_1^3x_2^2-2\cdot x_2^3x_3^2-11\cdot x_1x_2^2x_3^2-2\cdot x_1^3x_2x_3$ via elementary symmetric polynomials.

Answer:

99:$\left[-2\cdot s_1s_2^2+2\cdot s_1^2s_3-5\cdot s_2s_3\right]$

/en/higher algebra/Factorization, Internal name: **ZrazlpoliZ**,

Name:

Var.:**100.** Group: Day/Mo/Year:

Find the complex roots of the polynomial $x^4-18\cdot x^3+81\cdot x^2+90^2$ and decompose it into a product of irreducible over $\mathbb{R}$ polynomials.

Answer:

100:$\left[12\pm6\cdot i,\quad -3\pm6\cdot i,\quad x^2-24\cdot x+180,\ x^2+6\cdot x+45\right]$

8 Matrix.

/en/Matrix/Matrix operations, Internal name: **ZmatroperZ**,

Name:

Var.:**101.** Group: Day/Mo/Year:

$$\left(3\cdot\begin{pmatrix}-2&2\\-1&2\end{pmatrix}+\begin{pmatrix}2&-2\\-1&-1\end{pmatrix}\right)\cdot\begin{pmatrix}-1&1\\2&-1\end{pmatrix}=$$

101:$\left[\begin{pmatrix}12&-8\\14&-9\end{pmatrix}\right]$

/en/Matrix/Matrix multiplication, Internal name: **ZzprmtrZ**,

Name:

Var.:**102.** Group: Day/Mo/Year:

$$\begin{pmatrix}-3&-3\\1&-3\\-3&2\end{pmatrix}\cdot\begin{pmatrix}3&-1&3\\-1&1&-2\end{pmatrix}=$$

102:$\left[\begin{pmatrix}-6&0&-3\\6&-4&9\\-11&5&-13\end{pmatrix}\right]$

/en/Matrix/Cofactor, Internal name: **ZalgdopiZ**,

Name:

Var.:**103.** Group: Day/Mo/Year:

The matrix $A=\begin{pmatrix}3&3&2\\-2&2&2\\2&-2&2\end{pmatrix}$ is given.

Find the cofactor of

$A_{32}=$, $A_{11}=$.

103:$\left[A_{32}=-10,\ A_{11}=8\right]$

/en/Matrix/Determinant 3x3, Internal name: **ZoprediiiZ**,

Name:

Var.:**104.** Group: Day/Mo/Year:

$$\det\begin{pmatrix}-1&2&1\\-2&1&0\\0&-1&-1\end{pmatrix}=$$

104:$\left[-1\right]$

/en/Matrix/Determinant 4x4, Internal name: **ZopredivZ**,

Name:

Var.:**105.** Group: Day/Mo/Year:

$$\det\begin{pmatrix}7&6&-4&10\\5&5&-3&5\\-8&-7&5&-20\\5&4&-3&15\end{pmatrix}=$$

105:$\left[5\right]$

/en/Matrix/Determinant 5x5, Internal name: **ZopredvZ**,

Name:

Var.:**106.** Group: Day/Mo/Year:

$$\det\begin{pmatrix}1&0&0&0&0\\1&0&0&-2&4\\2&1&2&-1&-4\\-1&0&0&1&0\\0&1&1&1&-4\end{pmatrix}=$$

106:$\left[-4\right]$

/en/Matrix/Inverse 2x2 matrix, Internal name: **ZobrattZ**,

Name:

Var.:**107.** Group: Day/Mo/Year:

Find the inverse matrix to the matrix
$\begin{pmatrix}8&-13\\-19&31\end{pmatrix}$

Answer:

107:$\left[\begin{pmatrix}31&13\\19&8\end{pmatrix};\right]$

/en/Matrix/Inverse 3x3 matrix, Internal name: **ZobratZ**,

Name:

Var.:**108.** Group: Day/Mo/Year:

Find the inverse matrix to the matrix
$\begin{pmatrix}0&1&1\\-1&1&-1\\0&0&1\end{pmatrix}$

Answer:

108:$\left[\begin{pmatrix}1&-1&-2\\1&0&-1\\0&0&1\end{pmatrix};\right]$

/en/Matrix/Inverse 4x4 matrix, Internal name: **ZobratttZ**,

Name:

Var.:**109.** Group: Day/Mo/Year:

Find the inverse matrix to the matrix
$\begin{pmatrix}1&0&0&0\\0&1&-1&-1\\0&0&1&1\\1&-1&1&2\end{pmatrix}$

Answer:

109:$\left[\begin{pmatrix}1&0&0&0\\0&1&1&0\\1&-1&1&-1\\-1&1&0&1\end{pmatrix}\right]$

/en/Matrix/Inverse 5x5 matrix, Internal name: **ZobratvZ**,

Name:

Var.:**110.** Group: Day/Mo/Year:

Find the inverse matrix to the matrix
$\begin{pmatrix} 1 & -1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0 & 0 \\ 1 & -1 & 0 & 1 & 1 \\ 0 & 0 & -1 & -1 & 1 \end{pmatrix}$

Answer:

110: $\left[\begin{pmatrix} 1 & 1 & 0 & 0 & 0 \\ -1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 0 \\ -1 & 0 & 0 & 1 & 0 \\ -1 & 0 & 1 & 1 & 1 \end{pmatrix}\right]$

/en/Matrix/Matrix equation 2x2 (training), Internal name: **ZMatrEqqZ**,

Name:

Var.:**111.** Group: Day/Mo/Year:

Find A^{-1} and solve matrix equations
$A = \begin{pmatrix} 1 & -1 \\ -1 & 2 \end{pmatrix}; A \cdot X = \begin{pmatrix} 2 & -2 \\ -2 & 5 \end{pmatrix};$
$Y \cdot A = \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$

111: $\left[A^{-1} = \begin{pmatrix} 2 & 1 \\ 1 & 1 \end{pmatrix}, X = \begin{pmatrix} 2 & 1 \\ 0 & 3 \end{pmatrix}, Y = \begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}\right]$

/en/Matrix/Matrix equation 2x2, Internal name: **ZMatrEq2Z**,

Name:

Var.:**112.** Group: Day/Mo/Year:

Find A^{-1} and solve the matrix equation.
$A = \begin{pmatrix} -1 & -1 \\ -1 & 0 \end{pmatrix}; \quad A \cdot X = \begin{pmatrix} -4 & -2 \\ -2 & -1 \end{pmatrix}$

112: $\left[A^{-1} = \begin{pmatrix} 0 & -1 \\ -1 & 1 \end{pmatrix}, X = \begin{pmatrix} 2 & 1 \\ 2 & 1 \end{pmatrix}\right]$

/en/Matrix/Matrix equation 3x3, Internal name: **ZMatrEq3Z**,

Name:

Var.:**113.** Group: Day/Mo/Year:

Find A^{-1} and solve the matrix equation.
$A = \begin{pmatrix} -1 & 0 & 0 \\ 1 & 1 & 1 \\ 0 & -1 & 0 \end{pmatrix}; \quad X \cdot A = \begin{pmatrix} 1 & 0 & 1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{pmatrix}$

113: $\left[A^{-1} = \begin{pmatrix} -1 & 0 & 0 \\ 0 & 0 & -1 \\ 1 & 1 & 1 \end{pmatrix}, X = \begin{pmatrix} 0 & 1 & 1 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}\right]$

/en/Matrix/Matrix equation 4x4 , Internal name: **ZMatrEq4Z**,

Name:

Var.:**114.** Group: Day/Mo/Year:

Find A^{-1} and solve the matrix equation.
$A = \begin{pmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 1 & -1 \\ 0 & -1 & 0 & 1 \\ 1 & 0 & 0 & 1 \end{pmatrix}; \quad X \cdot A = \begin{pmatrix} -1 & 1 & 1 & -1 \\ 0 & 1 & 1 & 0 \\ 0 & 1 & 1 & -1 \\ 0 & 0 & 1 & 1 \end{pmatrix}$

114: $\left[A^{-1} = \begin{pmatrix} -1 & 0 & 0 & 0 \\ 1 & 0 & -1 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \end{pmatrix}, X = \begin{pmatrix} 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 1 \end{pmatrix}\right]$

/en/Matrix/Matrix equation 5x5, Internal name: **ZMatrEq5Z**,

Name:

Var.:**115.** Group: Day/Mo/Year:

Find A^{-1} and solve the matrix equation.
$A = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & -1 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & -1 & 0 & -1 & 2 \end{pmatrix}; \quad A \cdot X = \begin{pmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 & 1 \\ 1 & 1 & 2 & 1 & 1 \\ 1 & 1 & 1 & 1 & 0 \\ -1 & 1 & -1 & -1 & -1 \end{pmatrix}$

115: $\left[A^{-1} = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ -1 & 2 & 1 & -1 & 1 \\ -1 & 0 & 1 & 0 & 0 \\ 1 & 0 & -1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 \end{pmatrix}, X = \begin{pmatrix} 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 \end{pmatrix}\right]$

/en/Matrix/Matrix equation 6x6, Internal name: **ZMatrEq6Z**,

Name:

Var.:**116.** Group: Day/Mo/Year:

Find A^{-1} and solve the matrix equation.

$$A = \begin{pmatrix} -1 & 0 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 1 & 0 & -1 \\ 0 & -1 & -1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 \end{pmatrix}; \quad A \cdot X = \begin{pmatrix} -1 & 0 & -1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 1 & 0 & 0 \\ 2 & 1 & 3 & -1 & 0 & 0 \\ -1 & -1 & -2 & -1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 1 & 1 & 2 \end{pmatrix}$$

116: $\left[A^{-1} = \begin{pmatrix} -1 & 0 & 0 & 0 & -1 & 1 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & -1 & 0 & 0 \\ 1 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & -1 & 1 \end{pmatrix}, \right.$

$\left. X = \begin{pmatrix} 1 & 1 & 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 1 & 1 \end{pmatrix} \right]$

9 Linear algebra.

/en/Linear algebra/Matrix core, Internal name: **ZkeriZ**,

Name:

Var.:**117.** Group: Day/Mo/Year:

Find a basis of the kernel of a matrix:

$$\begin{pmatrix} -2 & 1 & 6 & -5 \\ -1 & 1 & 4 & -3 \\ -2 & 1 & 6 & -5 \end{pmatrix}$$

Answer:

117: $\left[(2x_3 - 2x_4,\ -2x_3 + 1x_4,\ x_3, x_4)\right]$

/en/Linear algebra/Orthogonal addition, Internal name: **ZortdopZ**,

Name:

Var.:**118.** Group: Day/Mo/Year:

Find the basis of the orthogonal complement to the set of vectors $\{(4, -2, 12, -4),\ (7, -3, 20, -8),\ (-2, 1, -6, 2)\}$.

Answer:

118: $\left[(-2x_3 + 2x_4,\ 2x_3 + 2x_4,\ x_3, x_4)\right]$

/en/Linear algebra/Mirror reflection on the plane, Internal name: **ZzerkZ**,

Name:

Var.:**119.** Group: Day/Mo/Year:

Find the matrix of the linear operator reflecting the mirror plane with respect to the line running along the vector with the coordinates $(-4, -5)$.

Answer:

119: $\left[\frac{1}{41} \begin{pmatrix} -9 & 40 \\ 40 & 9 \end{pmatrix}\right]$

/en/Linear algebra/Basis selection, Internal name: **ZsbazisZ**,

Name:

Var.:**120.** Group: Day/Mo/Year:

From the columns of the matrix, select the basis of the space generated by the columns and present the remaining columns as a linear combination of these base columns.

$$\begin{pmatrix} -5 & -4 & 2 & -4 & -5 \\ 2 & -1 & -6 & 2 & -1 \\ 1 & 2 & 2 & 1 & 2 \\ -2 & -1 & 2 & -2 & -1 \end{pmatrix}$$

Answer:

120: $\left[\begin{pmatrix} 1 & 0 & -2 & 0 & 1 \\ 0 & 1 & 2 & 0 & 1 \\ 0 & 0 & 0 & 1 & -1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}\right]$

/en/Linear algebra/The root of the 2x2 matrix in detail, Internal name: **ZsqrM2Z**,

Name:

Var.:**121.** Group: Day/Mo/Year:

Nothing

121:$[\begin{pmatrix} 1 & -2 \\ 4 & 7 \end{pmatrix}]$

/en/Linear algebra/Root of the 2x2 matrix, Internal name: **ZsqrM2iZ**,

Name:

Var.:**122.** Group: Day/Mo/Year:

Find a matrix A with positive eigenvalues such that $A \cdot A = \begin{pmatrix} -15 & 8 \\ -48 & 25 \end{pmatrix}$

Answer:

122:$[\begin{pmatrix} -3 & 2 \\ -12 & 7 \end{pmatrix}]$

/en/Linear algebra/Root of the 3x3 matrix detail, Internal name: **ZsqrM3Z**,

Name:

Var.:**123.** Group: Day/Mo/Year:

Nothing

123:$[\begin{pmatrix} -1 & -4 & -4 \\ 2 & 5 & 2 \\ 0 & 0 & 3 \end{pmatrix}]$

/en/Linear algebra/The square root of a 3x3 matrix, Internal name: **ZsqrM3iZ**,

Name:

Var.:**124.** Group: Day/Mo/Year:

Find a matrix A with positive eigenvalues such that $A \cdot A = \begin{pmatrix} 14 & 5 & 10 \\ 0 & 9 & 0 \\ -5 & -5 & -1 \end{pmatrix}$

Answer:

124:$[\begin{pmatrix} 4 & 1 & 2 \\ 0 & 3 & 0 \\ -1 & -1 & 1 \end{pmatrix}]$

/en/Linear algebra/Quadratic form 2x2, Internal name: **ZkvfiiZ**,

Name:

Var.:**125.** Group: Day/Mo/Year:

The quadratic form $(25 \cdot x^2 - 36 \cdot x \cdot y + 40 \cdot y^2)/13$ is given. Find the orthogonal change of variables, after which it takes the canonical form.

Answer:

125:$[1 \cdot x^2 + 4 \cdot y^2, \begin{pmatrix} 3 & -2 \\ 2 & 3 \end{pmatrix}/\sqrt{13}]$

/en/Linear algebra/Stupid vector prototype, Internal name: **ZobrazVecZ**,

Name:

Var.:**126.** Group: Day/Mo/Year:

The linear operator is given by the matrix $\begin{pmatrix} -3 & 3 \\ -2 & 1 \end{pmatrix}$.

Find the image of the vector $\begin{pmatrix} -3 \\ 3 \end{pmatrix}$. Answer:

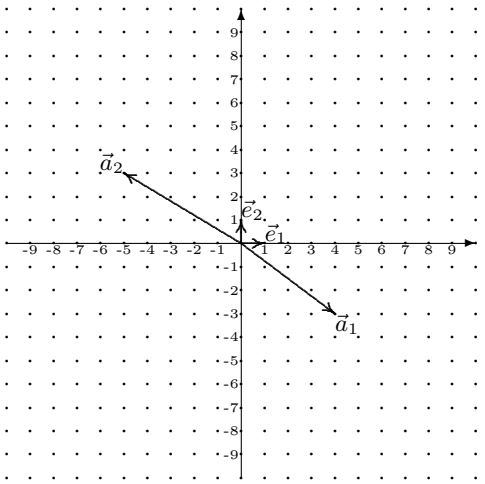
Find the prototype of the vector $\begin{pmatrix} 6 \\ 1 \end{pmatrix}$. Answer:

126:$[\begin{pmatrix} 18 \\ 9 \end{pmatrix}, \begin{pmatrix} 1 \\ 3 \end{pmatrix}]$

/en/Linear algebra/Vector image, Internal name: **ZmatrandvectZ**,

Name:

Var.:**127.** Group: Day/Mo/Year:



Find the matrix B of the linear operator of the mapping vector $\vec{a}_1$ in $\vec{e}_1$ and the vector $\vec{a}_2$ in $\vec{e}_2$.

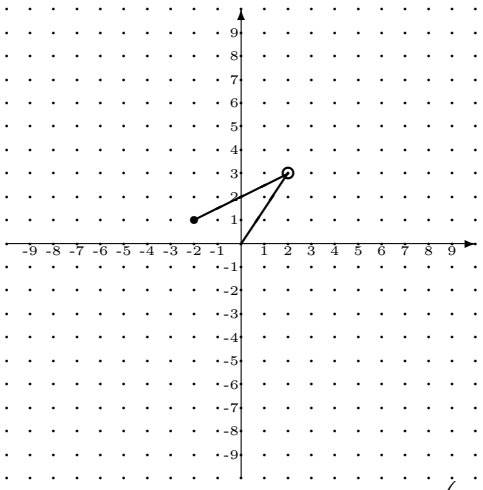
Answer: $A = \begin{pmatrix} \\ \end{pmatrix}$, $B = \begin{pmatrix} \\ \end{pmatrix}$

127:$[A = \begin{pmatrix} 4 & -5 \\ -3 & 3 \end{pmatrix}, B = \begin{pmatrix} -1 & \frac{-5}{3} \\ -1 & \frac{-4}{3} \end{pmatrix}]$

/en/Linear algebra/The image of the squiggles, Internal name: **ZlinoperiZ**,

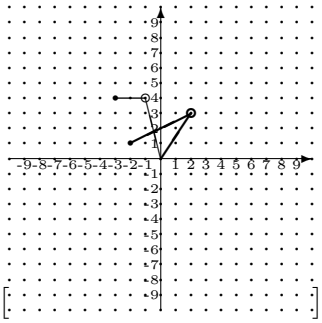
Name:

Var.:**128.** Group: Day/Mo/Year:



The linear operator is given by the matrix $\begin{pmatrix} 1 & -1 \\ -1 & 2 \end{pmatrix}$.

Draw the image of a squiggle.

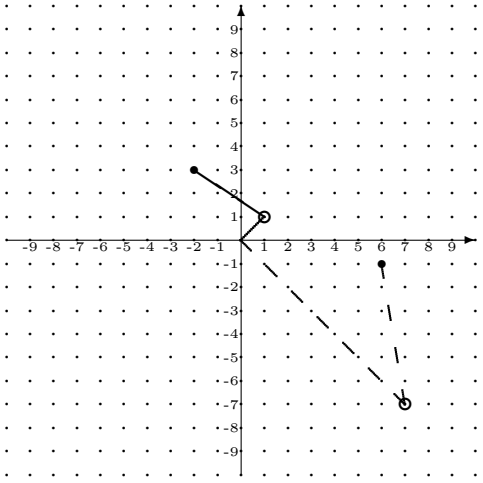


128:[ ]

/en/Linear algebra/Search matrix by squiggle, Internal name: **ZlinoperiiZ**,

Name:

Var.:**129.** Group: Day/Mo/Year:



Linear operator converts a solid to a dotted squiggle. Find the matrix of the operator.

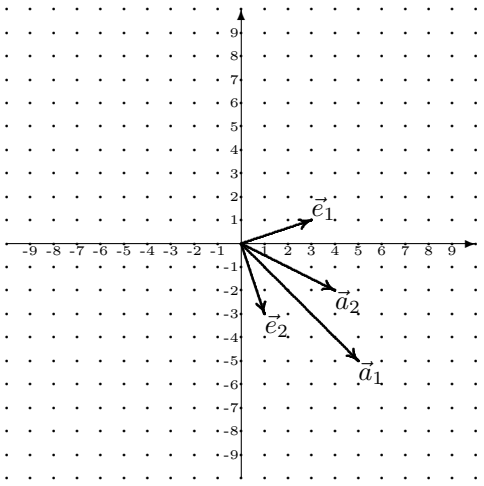
Answer:

129:[$\begin{pmatrix} 3 & 4 \\ -4 & -3 \end{pmatrix}$]

/en/Linear algebra/Matrix of transition to another basis, Internal name: **ZmatrcoordchiZ**,

Name:

Var.:**130.** Group: Day/Mo/Year:



Find the matrix of translation of coordinates from the coordinates in the basis $\vec{a}_1, \vec{a}_2$ to the coordinates in the basis $\vec{e}_1, \vec{e}_2$.

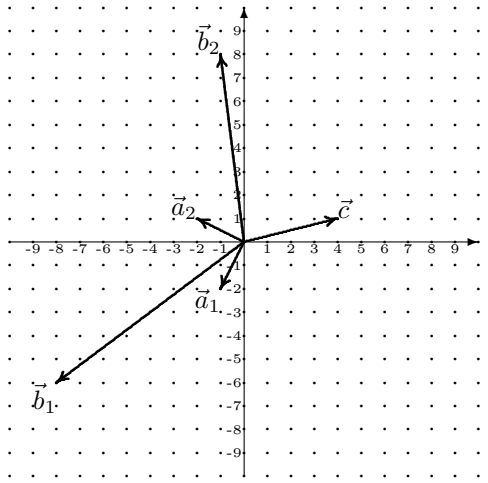
Answer: $T_{e \leftarrow a} =$

130:[$\begin{pmatrix} 1 & 1 \\ 2 & 1 \end{pmatrix}$]

/en/Linear algebra/Matrices of transition to other bases, Internal name: **ZmatrcoordchiiZ**,

Name:

Var.:**131.** Group: Day/Mo/Year:



Find all kinds of matrix translation of coordinates:

$T_{std\leftarrow a} = \begin{pmatrix} & \\ & \end{pmatrix}$, $T_{a\leftarrow std} = \begin{pmatrix} & \\ & \end{pmatrix}$,

$T_{std\leftarrow b} = \begin{pmatrix} & \\ & \end{pmatrix}$, $T_{b\leftarrow std} = \begin{pmatrix} & \\ & \end{pmatrix}$,

$T_{b\leftarrow a} = \begin{pmatrix} & \\ & \end{pmatrix}$, $T_{a\leftarrow b} = \begin{pmatrix} & \\ & \end{pmatrix}$

Find the coordinates of the vector $\vec{c}$ in different bases:

$\vec{c} = \begin{pmatrix} \\ \end{pmatrix}_{std}$, $\vec{c} = \begin{pmatrix} \\ \end{pmatrix}_{a}$, $\vec{c} = \begin{pmatrix} \\ \end{pmatrix}_{b}$

131: $\left[T_{std\leftarrow a} = \begin{pmatrix} -1 & -2 \\ -2 & 1 \end{pmatrix}, \quad T_{a\leftarrow std} = \begin{pmatrix} \frac{-1}{5} & \frac{-2}{5} \\ \frac{-2}{5} & \frac{1}{5} \end{pmatrix}, \right.$
$T_{std\leftarrow b} = \begin{pmatrix} -8 & -1 \\ -6 & 8 \end{pmatrix}, \quad T_{b\leftarrow std} = \begin{pmatrix} \frac{-4}{35} & \frac{-1}{70} \\ \frac{-3}{35} & \frac{4}{35} \end{pmatrix}$
$T_{b\leftarrow a} = \begin{pmatrix} \frac{1}{7} & \frac{3}{14} \\ \frac{-1}{7} & \frac{2}{7} \end{pmatrix}, \quad T_{a\leftarrow b} = \begin{pmatrix} 4 & -3 \\ 2 & 2 \end{pmatrix}, \quad \vec{c} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}_{std},$
$\left. \vec{c} = \begin{pmatrix} \frac{-6}{5} \\ \frac{-7}{5} \end{pmatrix}_{a}, \vec{c} = \begin{pmatrix} \frac{-33}{70} \\ \frac{-8}{35} \end{pmatrix}_{b} \right]$

/en/Linear algebra/Matrix of rotation in space (simple), Internal name: **ZmatrpoviiZ**,

Name:

Var.:**132.** Group: Day/Mo/Year:

1. Find the matrix defines the rotation clockwise by 90 degrees around the vector $(0, 1, 0)$. (basis orthonormal and negative oriented)

Answer:

2. Find the matrix defines the rotation counterclockwise by 90 degrees around the vector $(0, 0, 1)$. (the basis is orthonormal and positively oriented)

Answer:

3. Find the matrix defines the rotation clockwise by 90 degrees around the vector $(1, 0, 0)$. (the basis is orthonormal and positively oriented)

Answer:

132: $\left[1. \begin{pmatrix} 0 & 0 & -1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix} \; 2. \begin{pmatrix} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix} \; 3. \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & -1 \\ 0 & 1 & 0 \end{pmatrix} \right]$

/en/Linear algebra/Matrix of rotation in space, Internal name: **ZmatrpoviZ**,

Name:

Var.:**133.** Group: Day/Mo/Year:

Find the matrix defines the rotation of the counterclockwise 90 degrees around the vector $(1; 4; -8)$.

Answer:

133: $\left[\frac{1}{81} \cdot \begin{pmatrix} 1 & -68 & -44 \\ 76 & 16 & -23 \\ 28 & -41 & 64 \end{pmatrix}\right]$

/en/Linear algebra/Eigenvector, Internal name: **ZsobvektZ**,

Name:

Var.:**134.** Group: Day/Mo/Year:

Find the eigenvalues and eigenvectors of the matrix $\begin{pmatrix} 20 & 6 \\ -72 & -22 \end{pmatrix}$

Answer:

134: $\left[2 \begin{pmatrix} 1 \\ -3 \end{pmatrix}, -4 \begin{pmatrix} -1 \\ 4 \end{pmatrix}\right]$

/en/Linear algebra/Eigenvalue vector, Internal name: **ZsobvektmZ**,

Name:

Var.:**135.** Group: Day/Mo/Year:

$A = \begin{pmatrix} -24 & 14 \\ -42 & 25 \end{pmatrix}$. Which eigenvalue corresponds to the eigenvector $\begin{pmatrix} -1 \\ -2 \end{pmatrix}$?

Answer:

135: $[4]$

/en/Linear algebra/Gram Schmidt orthogonalization, Internal name: **ZOGSHZ**,

Name:

Var.:**136.** Group: Day/Mo/Year:

Apply the method of orthogonalization Gram-Schmidt to the vectors $A = (-4, -2, 1, 0)$, $B = (-7, -3, 8, 1)$, $C = (2, 2, -9, 128)$.

Answer:

136: $[A = (-4, -2, 1, 0), \quad B = (1, 1, 6, 1), \quad C = (-4, -2, -20, 126); \; B := B - 2 \cdot A; \; C := C + A - 2 \cdot B]$

/en/Linear algebra/Axis of rotation, Internal name: **ZortMatrZ**,

Name:

Var.:**137.** Group: Day/Mo/Year:

The orthogonal matrix is given. Find the axis of rotation and the cosine of the angle of rotation.

$\frac{1}{13} \cdot \begin{pmatrix} 12 & -3 & 4 \\ 3 & -4 & -12 \\ 4 & 12 & -3 \end{pmatrix}$

Answer:

137: $[(4, 0, 1), \cos\alpha = \frac{-4}{13} = -0.308]$

/en/Linear algebra/Jordan canonical form, Internal name: **ZJordZ**,

Name:

Var.:**138.** Group: Day/Mo/Year:

Lead to the Jordan form.

$$\begin{pmatrix} 6 & -2 & -1 & -2 & 1 \\ 0 & 4 & 1 & 0 & 0 \\ 0 & 0 & 4 & 0 & 0 \\ 4 & -4 & -3 & 0 & 2 \\ 0 & 0 & 2 & 0 & 2 \end{pmatrix}$$

(Hint: eigenvalues 4 and 2)

138:

/en/Linear algebra/Polar decomposition, Internal name: **ZpolrazZ**,

Name:

Var.:**139.** Group: Day/Mo/Year:

Present the matrix $A = \begin{pmatrix} -99 & -243 \\ 27 & -261 \end{pmatrix}$ as a product of $A = B \cdot C$, where B — symmetric matrix by positive eigenvalues and C — orthogonal matrix.

Answer:

139: $[B = \begin{pmatrix} 225 & 135 \\ 135 & 225 \end{pmatrix}, C = \frac{1}{5} \cdot \begin{pmatrix} -4 & -3 \\ 3 & -4 \end{pmatrix}]$

/en/Linear algebra/Polar decomposition (with check), Internal name: **ZpolrazvZ**,

Name:

Var.:**140.** Group: Day/Mo/Year:

Nothing

140: $[B = \begin{pmatrix} 65 & 45 \\ 45 & 185 \end{pmatrix}, C = \frac{1}{5} \cdot \begin{pmatrix} 3 & 4 \\ -4 & 3 \end{pmatrix}]$

/en/Linear algebra/Shift quadrics, Internal name: **ZsdvigKvadZ**,

Name:

Var.:**141.** Group: Day/Mo/Year:

The line on the plane is given by the equation

$$41 \cdot x^2 + 37 \cdot y^2 - 410 \cdot x + 148 \cdot y - 344 = 0.$$

Bring it to the canonical form, draw "old" and the canonical coordinate system and the line. Calculate the coordinates of the new center and focuses in the coordinate system OXY.

Answer:

141: $[\frac{(x-5)^2}{37} + \frac{(y+2)^2}{41} = 1, \; F_1(5, -4), \; F_2(5, 0)]$

/en/Linear algebra/Turn quadrics, Internal name: **ZKVADRgrafiZ**,

Name:

Var.:**142.** Group: Day/Mo/Year:

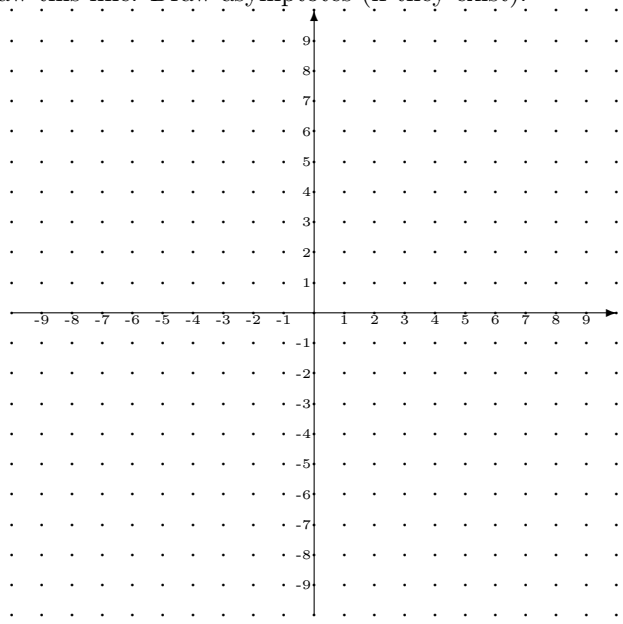
The equation of the line is given: $52x^2 + 73y^2 - 72xy = 2500$. Find the orthogonal change of variables

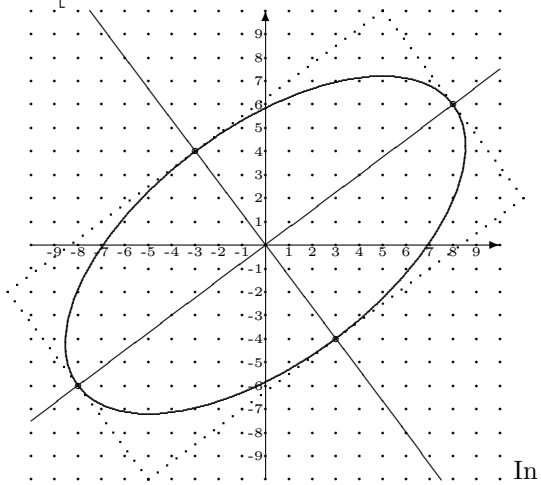
$$\begin{cases} x = \frac{(\quad)}{(\quad)} \cdot x_1 + \frac{(\quad)}{(\quad)} \cdot y_1 \\ y = \frac{(\quad)}{(\quad)} \cdot x_1 + \frac{(\quad)}{(\quad)} \cdot y_1 \end{cases}$$

after which the equation becomes the canonical equation of the quadric:

$$\left(\frac{x_1}{\quad}\right)^2 \quad \left(\frac{y_1}{\quad}\right)^2 = 1$$

Draw this line. Draw asymptotes (if they exist).



142: [ In replacement there is -3 and 4. Equation: $4x^2 + 1y^2 = 100$ or $(x/5)^2 + (y/10)^2 = 1$]

/en/Linear algebra/Circle radius, Internal name: **ZradiusiZ**,

Name:

Var.:**143.** Group: Day/Mo/Year:

Find the radius of the circle: $x^2 + y^2 - 6 \cdot x - 27 = 0$.

Answer:

143: [6]

/en/Linear algebra/Linear combination, Internal name: **ZlinCombZ**,

Name:

Var.:**144.** Group: Day/Mo/Year:

Represent vector $\vec{c} = (-2; 22; -4)$ as a linear combination of vectors $\vec{a} = (1; 28; -4)$ and $\vec{b} = (-1; -41; 6)$.

Answer:

144: $\left[\vec{c} = -8 \cdot \vec{a} - 6 \cdot \vec{b}\right]$

/en/Linear algebra/The basis of the intersection, Internal name: **ZbazPerZ**,

Name:

Var.:**145.** Group: Day/Mo/Year:

Find a basis of the intersection:
$\langle \begin{pmatrix} 3 \\ -4 \\ -5 \end{pmatrix}, \begin{pmatrix} 2 \\ -3 \\ -4 \end{pmatrix}, \begin{pmatrix} 6 \\ -9 \\ -12 \end{pmatrix} \rangle \cap \langle \begin{pmatrix} -5 \\ 9 \\ 14 \end{pmatrix}, \begin{pmatrix} 7 \\ -11 \\ -18 \end{pmatrix} \rangle$

Answer:

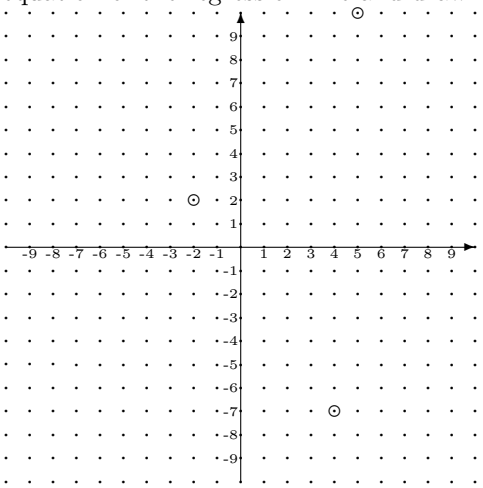
145: $\left[\lambda \cdot (-1, 2, 3)\right]$

/en/Linear algebra/Regression line, Internal name: **ZrglineiZ**,

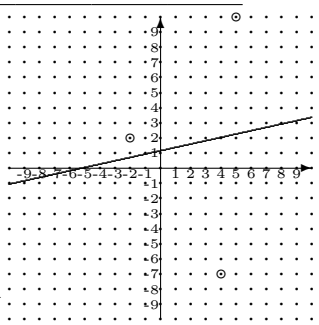
Name:

Var.:**146.** Group: Day/Mo/Year:

Find the equation of the regression line and draw it.



Answer: $y = (\quad) \cdot x + (\quad)$



146: [$y = \frac{19}{86} \cdot x + \frac{99}{86} \approx 0.22 \cdot x + 1.15$]

10 Mathematical analysis.

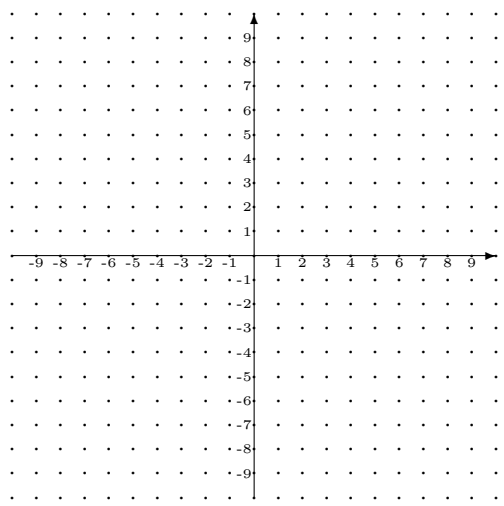
/en/Mathematical analysis/Schedule shift, Internal name: **ZgipZ**,

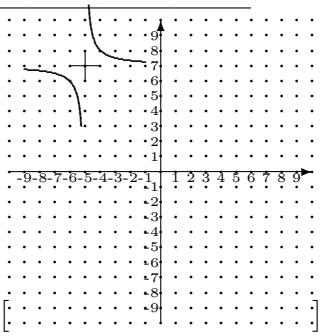
Name:

Var.:**147.** Group: Day/Mo/Year:

Draw a curve defined by the equation:

$$y = \frac{1}{x+5} + 7$$





147:[ ]

/en/Mathematical analysis/The limit of a fraction, Internal name: **ZlimPolZ**,

Name:

Var.:**148.** Group: Day/Mo/Year:

$$\lim_{x \to -9} \frac{x^2 + 8 \cdot x - 9}{x^2 + 7 \cdot x - 18} =$$

148:$\left[\frac{10}{11} \approx 0.909\right]$

/en/Mathematical analysis/Limit with fraction to infinity, Internal name: **ZlimPoliZ**,

Name:

Var.:**149.** Group: Day/Mo/Year:

$$\lim_{x \to \infty} \frac{-9 \cdot x^5 - 8 \cdot x^4 - 3}{3 \cdot x^6 - 9 \cdot x^2 + 6} =$$

149:$\left[0\right]$

/en/Mathematical analysis/Limit with roots, Internal name: **ZlimiZ**,

Name:

Var.:**150.** Group: Day/Mo/Year:

$$\lim_{x \to \infty} (\sqrt{16 \cdot x^2 + 58 \cdot x + 8} - \sqrt{16 \cdot x^2 + 2 \cdot x + 5}) =$$

Answer:

150:$\left[7\right]$

/en/Mathematical analysis/The second remarkable limit, Internal name: **ZlimiiZ**,

Name:

Var.:**151.** Group: Day/Mo/Year:

$$\lim_{x \to 2} \left((x^2 - 19 \cdot x + 35)^{\frac{1}{x^2 - 5 \cdot x + 6}}\right) =$$

Answer:

151:$\left[e^{15}\right]$

/en/Mathematical analysis/Asymptotes, Internal name: **ZasimptotZ**,

Name:

Var.:**152.** Group: Day/Mo/Year:

Find the asymptotes of the graph of a function. Represent its behavior near the asymptotes

$$y = \frac{\ln(x+2) + 5x^2 - 2x - 9}{x+1}$$

Answer:

152:$\left[\, y = 5x - 7,\, x = -2,\, f(-2+0) = +\infty,\; x = -1,\; f(-1-0) = +\infty,\; f(-1+0) = -\infty\right]$

/en/Mathematical analysis/Tangent, Internal name: **ZkasZ**,

Name:

Var.:**153.** Group: Day/Mo/Year:

Find the coordinates of the point of intersection of two tangents to the graph of the function $x^2 - 7 \cdot x + 4$. The first tangent is drawn at the point with $x = 3$, and the second at the point with $x = 1$.

Answer:

153:$\left[(2, -7)\right]$

/en/Mathematical analysis/Tangents (details), Internal name: **ZkasiZ**,

Name:

Var.:**154.** Group: Day/Mo/Year:

Two tangents are drawn to the graph of the function $x^2 - 6 \cdot x + 4$. The first tangent is drawn at the point with $x = 3$, and the second at the point with $x = 1$. Find: the equations of these tangents and the point of intersection of these tangents with each other.

Answer:

154:$\left[(2, -5)\right]$

/en/Mathematical analysis/Min max on segment, Internal name: **ZminmaxZ**,

Name:

Var.:**155.** Group: Day/Mo/Year:

Find the largest and smallest value of the function $y = x^3 + (-6) \cdot x^2 + (9) \cdot x + (1)$ on the segment $1 \leqslant x \leqslant 5$.

Answer:

155:$\left[(3, 1), (5, 21)\right]$

/en/Mathematical analysis/Extreme and inflection points, Internal name: **ZdotextZ**,

Name:

Var.:**156.** Group: Day/Mo/Year:

$f(x) = x^3 - 12 \cdot x^2 + 21 \cdot x - 10$. Find the maximum point, minimum point and inflection point.

Answer:

156:[Max= 1, Min= 7, inflection point= 4]

/en/Mathematical analysis/Minimum and maximum in the area, Internal name: **ZminmaxiiZ**,

Name:

Var.:**157.** Group: Day/Mo/Year:

Find the largest and smallest value of the function of two variables $z = x^2 + 8 \cdot x + y^2 - 4 \cdot y$ in a triangle with vertices $A = (-7, 1)$, $B = (-3, 1)$ and $C = (-3, 9)$.

Answer:

157:[$(-4, 2, -20)$, $(-3, 9, 30)$]

/en/Mathematical analysis/Derivative, Internal name: **ZdiferZ**,

Name:

Var.:**158.** Group: Day/Mo/Year:

$$\left(\frac{\cos(\sqrt{x})}{(x^3) - 6 \cdot x}\right)' =$$

158:[]

/en/Mathematical analysis/The value of the derivative with a fraction, Internal name: **ZproizdrZ**,

Name:

Var.:**159.** Group: Day/Mo/Year:

$$f(x) = \frac{7 \cdot x^2 + 3 \cdot x - 9}{x - 1}.$$

Find $f'(2)$.

Answer:

159:[6]

/en/Mathematical analysis/The value derived from the root, Internal name: **ZproizsqrtZ**,

Name:

Var.:**160.** Group: Day/Mo/Year:

$f(x) = \sqrt{-4 \cdot x^2 - 20 \cdot x - 20}$. Find $f'(-3)$.

Answer:

160:[1]

/en/Mathematical analysis/Value of the second order derivative, Internal name: **ZproizdvaZ**,

Name:

Var.:**161.** Group: Day/Mo/Year:

$f(x) = x^3 + 2 \cdot x^2 + 3 \cdot x + 3$. To find $f''(5)$.

Answer:

161:[34]

/en/Mathematical analysis/Partial derivative, Internal name: **ZpatdefZ**,

Name:

Var.:**162.** Group: Day/Mo/Year:

Calculate z'_x.

$$z = \frac{e^{(x^{-5}+y)} \sin(-5 \cdot x + y)}{x^{-5} - 3 \cdot y^3}$$

162:[]

/en/Mathematical analysis/Simple private derivative, Internal name: **ZpatdefiZ**,

Name:

Var.:**163.** Group: Day/Mo/Year:

The function of two variables is given: $2 \cdot x \cdot y + 9 \cdot x + 4 \cdot y$. Find the value of the partial derivative: $f'_y(-5, -4)$.

Answer:

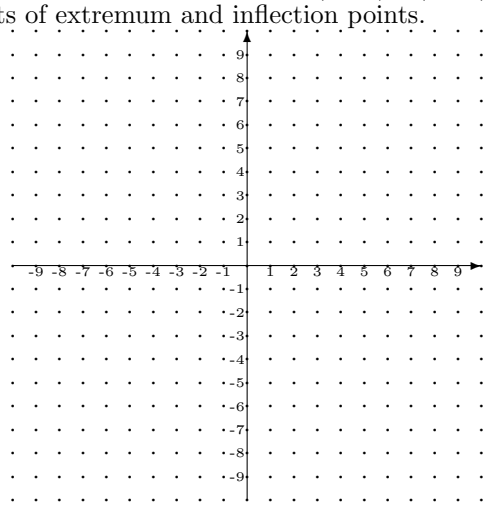
163:[−6]

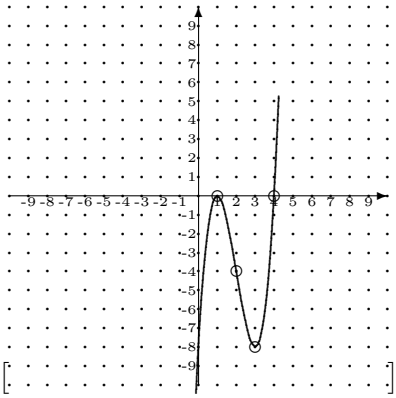
/en/Mathematical analysis/Plotting function, Internal name: **ZpiciZ**,

Name:

Var.:**164.** Group: Day/Mo/Year:

Draw the graph of function $y = (2)\cdot\left(x-1\right)^{2}\cdot\left(x-4\right)$, specify the points of extremum and inflection points.





164:[ ]

11 Integrals.

/en/Integrals/Simple definite integral, Internal name: **ZsIntZ**,

Name:

Var.:**165.** Group: Day/Mo/Year:

$$\int_{-2}^{-1} -15\cdot x^{2} - 8\cdot x - 8\; dx =$$

165:$\left[-31\right]$

/en/Integrals/Rational integral 1, Internal name: **Zinti1Z**,

Name:

Var.:**166.** Group: Day/Mo/Year:

$$\int \frac{-4\cdot x - 13}{x^{2} + 5\cdot x + 4}\; dx =$$

166:$\left[-1\ln(x+4)-3\ln(x+1)\right]$

/en/Integrals/Rational integral 2, Internal name: **Zinti2Z**,

Name:

Var.:**167.** Group: Day/Mo/Year:

$$\int \frac{-4\cdot x^{3} - 8\cdot x^{2} + 10\cdot x + 16}{x^{2} + 3\cdot x + 2}\; dx =$$

167:$\left[-2x^{2}+4x+4\ln(x+2)+2\ln(x+1)\right]$

/en/Integrals/Rational integral 3, Internal name: **Zinti3Z**,

Name:

Var.:**168.** Group: Day/Mo/Year:

$$\int \frac{8\cdot x^{2} + 6\cdot x + 2}{(x+1)\cdot(x^{2}-1)}\; dx =$$

168:$\left[4\ln(x+1)+2/\left(x+1\right)+4\ln\left(x-1\right)\right]$

/en/Integrals/Rational integral 4, Internal name: **Zinti4Z**,

Name:

Var.:**169.** Group: Day/Mo/Year:

$$\int \frac{-2\cdot x + 7}{x^{2} - 4\cdot x + 5}\; dx =$$

169:$\left[-1\ln(x^{2}-4\cdot x+5)+3arctg(x-2)\right]$

/en/Integrals/Rational integral 5, Internal name: **Zinti5Z**,

Name:

Var.:**170.** Group: Day/Mo/Year:

$$\int \frac{6 \cdot x + 27}{x^2 + 6 \cdot x + 18}\, dx =$$

170: $\left[3\ln(x^2 + 6 \cdot x + 18) + 3arctg((x+3)/3)\right]$

/en/Integrals/Rational integral 6, Internal name: **Zinti6Z**,

Name:

Var.:**171.** Group: Day/Mo/Year:

$$\int \frac{2 \cdot x^3 - 6 \cdot x^2 - 2 \cdot x + 21}{x^2 - 4 \cdot x + 5}\, dx =$$

171: $\left[x^2 + 2 \cdot x - 2\ln(x^2 - 4 \cdot x + 5) + 3arctg(x-2)\right]$

/en/Integrals/Integral by parts, Internal name: **ZintiiZ**,

Name:

Var.:**172.** Group: Day/Mo/Year:

$$\int (6 \cdot x + 4) \cdot \sin(3 \cdot x - 2)\, dx =$$

172: $\left[(-2x + \frac{-4}{3})\cos(3x-2) + \frac{2}{3}\sin(3x-2)\right]$

/en/Integrals/Definite integral (simple), Internal name: **ZointiZ**,

Name:

Var.:**173.** Group: Day/Mo/Year:

$$\int_{\pi/4}^{\pi/3} 384 \cdot \cos^5(x) \cdot \sin(x)\, dx =$$

173: $\left[7\right]$

/en/Integrals/Integral square, Internal name: **ZplintZ**,

Name:

Var.:**174.** Group: Day/Mo/Year:

Find the area of the figure bounded by lines $y = x^2 - 2 \cdot x$ and $y = -x^2 + 4 \cdot x$.

Answer:

174: $\left[9\right]$

/en/Integrals/a figure of rotation, Internal name: **ZobTelVrashZ**,

Name:

Var.:**175.** Group: Day/Mo/Year:

Find the volume of the body obtained by rotating around the axis OX region, bounded by straight lines $y = \frac{5}{4} \cdot x + \frac{49}{4}$, $y = \frac{-1}{8} \cdot x + \frac{43}{8}$, $x = -9$, $x = 3$.

Answer:

175: $\left[891 \cdot \pi\right]$

/en/Integrals/Volume of the figure of rotation, Internal name: **ZobTelVrashiZ**,

Name:

Var.:**176.** Group: Day/Mo/Year:

Find the volume of the body obtained by rotating around the axis OX region, a limited line of $y = \sqrt{77 + 2 \cdot x}$ and square $x = 0$, $x = 4$, $y = 2 \cdot x + 5$.

Answer:

176: $\left[136 \cdot \pi\right]$

/en/Integrals/Double integral, Internal name: **ZdvintZ**,

Name:

Var.:**177.** Group: Day/Mo/Year:

Find the weight of the triangular plate, the coordinates of the vertices of which $(3,0)$, $(3,6)$, $(0,0)$ and the relative weight of the substance is given by the function $\rho = 9 \cdot y - 8$.

Answer:

177: $\left[90\right]$

/en/Integrals/Triple integral, Internal name: **ZtrintgZ**,

Name:

Var.:**178.** Group: Day/Mo/Year:

Find the weight of the air enclosed inside the pyramid $ABCD$. Vertex coordinates: $A = (0,0,0)$, $B = (1,1,12)$, $C = (1,1,0)$ and $D = (0,1,0)$. The relative weight of air is given by the formula $\rho = 3 \cdot z + 4$.

Answer:

178: $\left[26\right]$

/en/Integrals/Triple integral (complex), Internal name: **ZtrintZ**,

Name:

Var.:**179.** Group: Day/Mo/Year:

Find the weight of the air enclosed inside the pyramid $ABCD$. Vertex coordinates: $A = (0,0,0)$, $B = (3,1,16)$, $C = (3,1,0)$ and $D = (3,0,0)$. The relative weight of air at the top B is 4, at the vertex C is 3 and the axis OZ is directed upwards.

Answer:

179: $\left[26\right]$

/en/Integrals/Curvilinear, Internal name: **ZkrintZ**,

Name:

Var.:**180.** Group: Day/Mo/Year:

Make sure that the curvilinear integral

$$\int (-20 \cdot x^4 \cdot y^5 + 15 \cdot x^4)\, dx + (-20 \cdot x^5 \cdot y^4)\, dy$$

is independent of the integration path and calculate it from $A = (-1, 6)$ to $B = (1, -6)$.

Answer:

180: $\left[6\right]$

/en/Integrals/Simple curvilinear integral, Internal name: **ZkrvintiZ**,

Name:

Var.:**181.** Group: Day/Mo/Year:

Calculate the curvilinear integral of the second kind from the vector field (y, x) in a straight line from the point $(-5, 4)$ to a point $(0, 9)$.

Answer:

181: $\left[20\right]$

/en/Integrals/In polar coordinates, Internal name: **ZpolkoorZ**,

Name:

Var.:**182.** Group: Day/Mo/Year:

Calculate the double integral $\iint_D (x^2 + y^2 + 1)^{-2}\, dx\, dy$ with area D bounded by a circle of radius $r_1 = 2$ and $r_2 = 5$ with center at the origin and rays emerging from the origin at angles $\varphi_1 = 1.6$ and $\varphi_2 = 2.6$.

Answer:

182: $\left[0.0807692\right]$

/en/Integrals/Area of integration, Internal name: **ZpredintZ**,

Name:

Var.:**183.** Group: Day/Mo/Year:

The area of integration in the double integral is bounded by lines: $y + x^2 - 8 \cdot x + 28 = 0$; $4 \cdot y + 12 \cdot x = 0$; $2 \cdot y + 16 \cdot x = 0$. Set integration limits

$$\int_0 dx \int f(x,y)dy + \int^4 dx \int f(x,y)dy$$

183: $\left[\int_0^2 dx \int_{-8\cdot x}^{\frac{-12}{4}\cdot x} f(x,y)dy + \int_2^4 dx \int_{-x^2+8\cdot x-28}^{\frac{-12}{4}\cdot x} f(x,y)dy\right]$

12 Approximate calculation.

/en/Approximate calculation/Interpolation, Internal name: **ZinterpZ**,

Name:

Var.:**184.** Group: Day/Mo/Year:

Find a polynomial whose graph passes through $(1, 2)$, $(2, 10)$ and $(3, 22)$.

Answer:

184: $\left[2 \cdot x^2 + 2 \cdot x - 2\right]$

/en/Approximate calculation/Roots of numbers, Internal name: **ZpriblNZ**,

Name:

Var.:**185.** Group: Day/Mo/Year:

Calculate $\sqrt{1.5}$ approximately, by Newton, with an accuracy of three decimal places. (Start approximation with $x = 1$);

Answer:

185: $\left[1.22474\right]$

/en/Approximate calculation/The root of the polynomial is a Simple option, Internal name: **ZnrootiZ**,

Name:

Var.:**186.** Group: Day/Mo/Year:

Find the root of the polynomial $x^3 - 7 \cdot x + 1$ by Newton method. Make three iterations starting at $x_1 = 3$.

x	3		
y			

186:

x	3	2.65	2.575
y	7	1.06	0.049

/en/Approximate calculation/The root of the polynomial is a Complex variant, Internal name: **ZnrootiiZ**,

Name:

Var.:**187.** Group: Day/Mo/Year:

The function $y = x^3 - 8 \cdot x + 15$ is given. Find the maximum and minimum points. Find the intervals of increase and decrease. Find the root of the polynomial $x^3 - 8 \cdot x + 15$ by Newton method with accuracy of three decimal places.

Answer:

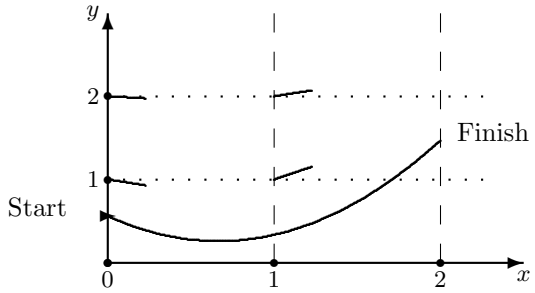
187: $\left[-3.504\right]$

/en/Approximate calculation/Euler method, Internal name: **ZdifureilerZ**,

Name:

Var.:**188.** Group: Day/Mo/Year:

This is the direction (more precisely, the coefficients of the slope) of the river in 4 points: $k(0,1) = -0.15$, $k(0,2) = -0.05$, $k(1,1) = 0.34$, $k(1,2) = 0.16$. The pilot starts from the point $(0, 0.56)$. Find (modified by the Euler method with conversion to within three decimal places) the finish point $(2, ?)$.



Answer:

188: $\left[(2, 1.468)\right]$

13 Informatics.

/en/Informatics/Transfer from one number system to another, Internal name: **ZsistScislZ**,

Name:

Var.:**189.** Group: Day/Mo/Year:

In 14-th number system the number is B3B. What is it equal to in 7-th system? What is equal in decimal?

Answer:

189: $\left[6304,\ 2209\right]$

/en/Informatics/Opposite integers, Internal name: **ZprotivIntZ**,

Name:

Var.:**190.** Group: Day/Mo/Year:

Eight-bit integers are used. The additional code is 22. Find the hexadecimal entry of the additional code of the opposite number.

Answer:

190: $\left[DE\right]$

/en/Informatics/Opposite integers (from decimal), Internal name: **ZprotivIntiZ**,

Name:

Var.:**191.** Group: Day/Mo/Year:

Eight-bit integers are used. Find the hexadecimal entry of the additional code for the number -107.

Answer:

191: $\left[95\right]$

/en/Informatics/Fractional binary to decimal, Internal name: **ZsistScislDrZ**,

Name:

Var.:**192.** Group: Day/Mo/Year:

In the binary system the number is 1100.1101
What is it in decimal?

Answer:

192: $\left[12.8125 = 1100.1101\right]$

/en/Informatics/Fractional decimal to binary, Internal name: **ZsistScislDriZ**,

Name:

Var.:**193.** Group: Day/Mo/Year:

In the decimal system the number is 14.3125
What is it in binary?

Answer:

193: $\left[14.3125 = 1110.0101\right]$

/en/Informatics/Machine representation of half-precision floating point numbers, Internal name: **ZIEEEhpbinZ**,

Name:

Var.:**194.** Group: Day/Mo/Year:

Binary16 (IEEE 754 half-precision binary floating-point format) is used. Left bit — sign, then five bits — order with shift 15 bit and 10 mantissa bit without one).
What is `4300` in the usual decimal notation?

Answer:

194: [3.5 = 0/10000/1100000000]

/en/Informatics/Machine representation of half-precision floating point numbers but Vice versa, Internal name: **ZIEEEhpbinRZ**,

Name:

Var.:**195.** Group: Day/Mo/Year:

Binary16 (IEEE 754 half-precision binary floating-point format) is used. Left bit — sign, then five bits — order with shift 15 bit and 10 mantissa bit without one).
What number corresponds to the usual number 6.5? (Write the answer in hexadecimal).

Answer:

195: [4680 = 0/10001/1010000000]

/en/Informatics/Machine representation of half-precision numbers with a floating point in both directions, Internal name: **ZIEEEhpbinRRZ**,

Name:

Var.:**196.** Group: Day/Mo/Year:

Binary16 (IEEE 754 half-precision binary floating-point format) is used. What number corresponds to the usual number 2.375? (Write the answer in hexadecimal).
What is `3A80` in the usual decimal notation?

Answer:

196: [`40C0`, 0.8125]

/en/Informatics/Machine representation of single precision floating point numbers, Internal name: **ZIEEEhpbiniZ**,

Name:

Var.:**197.** Group: Day/Mo/Year:

Binary32 (IEEE 754 single-precision binary floating-point format) is used. Left a bit — sign, then eight bits — right shift 127 and 23 significand bits, without units).
What is `C0B00000` in the usual decimal notation?

Answer:

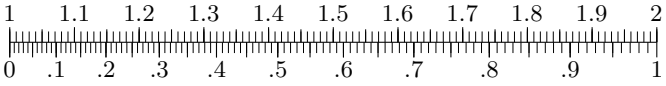
197: [−5.5 = 1/10000001/01100000000000000000000]

/en/Informatics/Entropy of two balls, Internal name: **ZentropiZ**,

Name:

Var.:**198.** Group: Day/Mo/Year:

In the box is 7 white and 3 black balls. Calculate the uncertainty of the experience of extracting one ball



Answer:

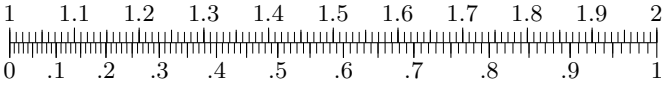
198: [0.881]

/en/Informatics/Conditional entropy of two balls, Internal name: **ZuslentriZ**,

Name:

Var.:**199.** Group: Day/Mo/Year:

In the box is 4 white and 3 black balls. A complex experience consists in the sequential execution of two simple experiments, each of which consists in extracting the ball without returning. Calculate the entropy of the first experience, conditional entropy and entropy of complex experience.



Answer:

199: [0.985, 1, 0.918, 0.965, 1.95]

/en/Informatics/Prefix code, Internal name: **ZprefCodZ**,

Name:

Var.:**200.** Group: Day/Mo/Year:

The code is given by table a-100 b-11 c-101 d-0. Decode
11101110100000011001101010010010 0

Answer:

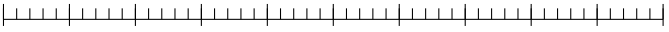
200: [bcbdaddddbddbdcddaa]

/en/Informatics/File compression, Internal name: **ZcodAndCmprsZ**,

Name:

Var.:**201.** Group: Day/Mo/Year:

Compress this file `abcdddcadcbdcdddadcdc` using Huffman's algorithm.
Answer: Table: a[ ] b[ ] c[ ] d[ ]
Result after compression:



After compression the file contains bit.

201: [Table: a-010 b-011 c-00 d-1, compression Result: 01001100111000101000111001110101001 00, after compression 37 bits.]

/en/Informatics/LZW compression, Internal name: **ZlzwiZ**,

Name:

Var.:**202.** Group: Day/Mo/Year:

Initial dictionary: `(0-a), (1-b), (2-c), (3-d).`
Compress `aababbccbbaa` according to the algorithm LZW.

Answer:

202: [Compressed file: `0 0 1 5 1 2 2 1 6 0`. Dictionary: `(0-a) (1-b) (2-c) (3-d) (4-aa) (5-ab) (6-ba) (7-abb) (8-bc) (9-cc) (10-cb) (11-bb) (12-baa).`]

/en/Informatics/LZW compression with the calculation of the coefficient, Internal name: **ZlzwivZ**,

Name:

Var.:**203.** Group: Day/Mo/Year:

Compress `aababaaaaabaaaaaaabaaaaacbaaa` by LZW algorithm and calculate compression ratio.
Dictionary: (0-00-a) (1-01-b) (2-10-c)
(3-11-) (4-100-) (5-101-) (6-110-)
(7-111-) (8-1000-) (9-1001-)
(10-1010-) (11-1011-) (12-1100-)
(13-1101-) (14-1110-) (15-1111-)
After compression (in decimal):

(in binary):

compression ratio:

203: [Compressed file: `0 0 1 4 3 7 5 7 8 10 0 2 9 0` or `00 00 001 100 011 111 0101 0111 1000 1010 0000 0010 1001 0000`. $K = 58/48 \approx 1.21$. Dictionary: `(0-00-a) (1-01-b) (2-10-c) (3-11-aa) (4-100-ab) (5-101-ba) (6-110-aba) (7-111-aaa) (8-1000-aaab) (9-1001-baa) (10-1010-aaaa) (11-1011-aaaba) (12-1100-aaaaa) (13-1101-ac) (14-1110-cb) (15-1111-baaa).`]

/en/Informatics/LZW unclench without conflict, Internal name: **ZlzwiiZ**,

Name:

Var.:**204.** Group: Day/Mo/Year:

Initial dictionary: `(0-a), (1-b), (2-c), (3-d).`
Unzip `0 1 2 1 4 0 0 6 1 1` using LZW algorithm.

Answer:

204: [Source file: `abcbabaacbbb`. Dictionary: `(0-a) (1-b) (2-c) (3-d) (4-ab) (5-bc) (6-cb) (7-ba) (8-aba) (9-aa) (10-ac) (11-cbb) (12-bb).`]

/en/Informatics/LZW unclenching with conflict, Internal name: **ZlzwiiiZ**,

Name:

Var.:**205.** Group: Day/Mo/Year:

Initial dictionary: `(0-a), (1-b), (2-c), (3-d).`
Unzip `1 1 0 5 1 2 4 10 9 2` using LZW algorithm.
(*The problem has a solution. Even if you think that it does not*).

Answer:

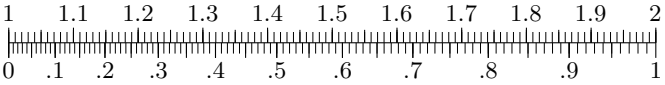
205: [Source file: `bbababcbbbbbcbc`. Dictionary: `(0-a) (1-b) (2-c) (3-d) (4-bb) (5-ba) (6-ab) (7-bab) (8-bc) (9-cb) (10-bbb) (11-bbbc) (12-cbc).`]

/en/Informatics/Huffman coding, Internal name: **ZcodAndCmprsiZ**,

Name:

Var.:**206.** Group: Day/Mo/Year:

Huffman code is used. The frequency of characters a-47.6% b-9.5% c-14.3% d-28.6%. Find the average length of the code, the average amount of information per sign of the primary alphabet, the relative redundancy of the code and encode `aacab`



Answer: Table: a[ ] b[ ] c[ ] d[ ]
Average length:
Average amount of information per sign:
The relative redundancy:
The result of the Coding:

206: [Table: a-1 b-011 c-010 d-00, average code length: 1.76, relative redundancy: 0.0068, I: 1.75013, encoding result: 110101011.]

/en/Informatics/Hamming coding, Internal name: **ZkodHemmZ**,

Name:

Var.:**207.** Group: Day/Mo/Year:

Code F3 with Hamming code with 8 information and 4 verification bits.

Answer:

207: [2E3]

/en/Informatics/Decoding the Hamming, Internal name: **ZkodHemmiZ**,

Name:

Var.:**208.** Group: Day/Mo/Year:

Received through communication channel BB4. Select the information message and write in the 16th system. (Used the Hamming code with 8 data bits and 4 verification bits)

Answer:

208: [F4]

/en/Informatics/Encoding and Decoding in the Hamming, Internal name: **ZkodHemmiiZ**,

Name:

Var.:**209.** Group: Day/Mo/Year:

Use the Hamming code with 8 data bits and 4 verification bits.
Find the code corresponding to the message 91.
Find the message corresponding to the code BAB (there is an error in the code).

Answer:

209: [231, DF]

14 Discrete mathematics.

/en/Discrete mathematics/Regular expressions and automata, Internal name: **ZautomatZ**, Construction of the machine on a regular expression. Random number of vertices

Name:

Var.:**210.** Group: Day/Mo/Year:

Find the minimum finite deterministic automaton that recognizes the language $ba^*(ba \cup \lambda) \cup a$.

Answer:

210: [$\begin{pmatrix} & 1 & 2 & 3 & 4 & 5 \\ a & 4 & 2 & 3 & 3 & 4 \\ b & 2 & 5 & 3 & 3 & 3 \end{pmatrix}$, In: 1, Out: 2, 4.]

/en/Discrete mathematics/Regular expressions and automata (3 vertices), Internal name: **ZautomatiZ**, Building an automaton for the regular expression

Name:

Var.:**211.** Group: Day/Mo/Year:

Find the minimum finite deterministic automaton that recognizes the language $(ba)^*b$.

Answer:

211: [$\begin{pmatrix} & 1 & 2 & 3 \\ a & 2 & 3 & 3 \\ b & 3 & 1 & 3 \end{pmatrix}$, In: 2, Out: 1.]

/en/Discrete mathematics/Regular expressions and automata (4 vertices), Internal name: **ZautomatiiZ**, Building an automaton for the regular expression

Name:

Var.:**212.** Group: Day/Mo/Year:

Find the minimum finite deterministic automaton that recognizes the language $a(a \cup \lambda) \cup \lambda$.

Answer:

212: [$\begin{pmatrix} & 1 & 2 & 3 & 4 \\ a & 1 & 4 & 1 & 3 \\ b & 1 & 1 & 1 & 1 \end{pmatrix}$, In: 2, Out: 2, 3, 4.]

/en/Discrete mathematics/Regular expressions and automata (5 vertices), Internal name: **ZautomatiiiZ**, Building an automaton for the regular expression

Name:

Var.:**213.** Group: Day/Mo/Year:

Find the minimum finite deterministic automaton that recognizes the language $ba^*(ba^*(b \cup \lambda) \cup \lambda) \cup a$.

Answer:

213: [$\begin{pmatrix} & 1 & 2 & 3 & 4 & 5 \\ a & 4 & 2 & 3 & 3 & 5 \\ b & 2 & 5 & 3 & 3 & 4 \end{pmatrix}$, In: 1, Out: 2, 4, 5.]

/en/Discrete mathematics/Regular expressions and automata (6 vertices), Internal name: **ZautomatiiiiZ**, Building an automaton for the regular expression

Name:

Var.:**214.** Group: Day/Mo/Year:

Find the minimum finite deterministic automaton that recognizes the language $ba^* \cup a(a \cup b)(a \cup b) \cup \lambda$.

Answer:

214: [$\begin{pmatrix} & 1 & 2 & 3 & 4 & 5 & 6 \\ a & 2 & 5 & 1 & 4 & 5 & 3 \\ b & 2 & 5 & 1 & 5 & 5 & 4 \end{pmatrix}$, In: 6, Out: 2, 4, 6.]

/en/Discrete mathematics/Regular expressions and automata (7 vertices), Internal name: **ZautomatiiiiiZ**, Building an automaton for the regular expression

Name:

Var.:**215.** Group: Day/Mo/Year:

Find the minimum finite deterministic automaton that recognizes the language $ba^* \cup ab^*(ab^*ab^*a \cup \lambda)$.

Answer:

215: [$\begin{pmatrix} & 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ a & 2 & 4 & 3 & 6 & 5 & 5 & 1 \\ b & 1 & 2 & 5 & 4 & 5 & 5 & 3 \end{pmatrix}$, In: 7, Out: 1, 3, 6.]

/en/Discrete mathematics/Minimization of the state machine, Internal name: **ZminautZ**, Six peaks. After minimization - four

Name:

Var.:**216.** Group: Day/Mo/Year:

To minimize the state machine

	1	2	3	4	5	6
a	3	3	1	2	3	4
b	1	3	3	5	3	2

,
In: 6, Out: 2, 4, 5, 6.

216: [$\begin{pmatrix} & (13) & (25) & (4) & (6) \\ a & (13) & (13) & (25) & (4) \\ b & (13) & (13) & (25) & (25) \end{pmatrix}$, In: (6), Out: (25), (4), (6).]

/en/Discrete mathematics/Minimization of the state machine (large), Internal name: **ZminautiZ**, Nine peaks. After minimization - five

Name:

Var.:**217.** Group: Day/Mo/Year:

To minimize the state machine

	1	2	3	4	5	6	7	8	9
a	2	9	2	7	9	4	7	4	6
b	7	3	4	7	3	8	4	8	5

,

In: 1, Out: 2, 5, 6, 8, 9.

217: [

		(13)	(25)	(47)	(68)	(9)
	a	(25)	(9)	(47)	(47)	(68)
	b	(47)	(13)	(47)	(68)	(25)

, In: (13), Out: (25), (68), (9).]

/en/Discrete mathematics/Pparsing grammar LL(1), Internal name: **ZgrammLLiZ**, Parsing LL(1) grammar

Name:

Var.:**218.** Group: Day/Mo/Year:

Given LL (1) grammar:

		FIRST
S_1	AB	
S_2	bA	
A_1	cc	
A_2	aA	
B_1	dS	
B_2	Sa	

Define FIRST and construct a syntax tree for the word `aaccbcca`.

218: [FIRST: ac, b, c, a, d, abc, Tree: (S (A a (A a (A cc))) (B (S b (A cc))a)).]

15 Coding.

/en/Coding/Error correction, Internal name: **ZprmatrrZ**,

Name:

Var.:**219.** Group: Day/Mo/Year:

The coding matrix K is given. Over the communication channel it is: 0 0 1 0 0 1 1 0 1 1 1 1 1 0 0 1 0 1 0 0 1 1 0 1 . Find the test matrix, correct errors and decode.

$$K = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{pmatrix} \quad P =$$

Answer:

219: [(1 0 0 1, 0 1 1 0, 1 0 1 0)]

/en/Coding/Error correction (complex), Internal name: **ZprmatrrrZ**,

Name:

Var.:**220.** Group: Day/Mo/Year:

The coding matrix K is given. Over the communication channel it is: 0 1 0 1 0 0 1 0 0 0 0 0 0 1 0 1 1 0 1 0 0 0 0 1 1 0 1 . Find the test matrix, correct errors and decode.

$$K = \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 \\ 1 & 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \quad P =$$

Answer:

220: [(0 0 1 1 1, 1 0 0 0 0, 0 1 0 0 1)]

/en/Coding/Error correction only, Internal name: **ZprmatrriZ**,

Name:

Var.:**221.** Group: Day/Mo/Year:

The coding matrix K is given. Over the communication channel it is: 1 1 1 0 1 0 1 0 1 0 1 0 0 1 0 0 1 0 1 1 0 1 1 1 . Find the test matrix, correct errors.

$$K = \begin{pmatrix} 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

Answer:

221: [(1 1 1 0 1 0 **0** 0, 1 0 1 0 0 1 **1** 0, 1 0 **0** 1 0 1 1 1)]

/en/Coding/Decoding, Internal name: **ZBdecodiZ**,

Name:

Var.:**222.** Group: Day/Mo/Year:

The coding matrix K is given. Find the decoding matrix D and decode the code words $a^T = (0\ 1\ 0\ 0\ 0\ 0\ 1)$, $b^T = (0\ 0\ 1\ 1\ 0\ 1\ 0)$ and $c^T = (1\ 1\ 1\ 1\ 1\ 0\ 1)$.

$$K = \begin{pmatrix} 0 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 \end{pmatrix} \quad D =$$

$(Da)^T =$
$(Db)^T =$
$(Dc)^T =$

222: $\big[(0\ 1\ 0\ 0),\ (1\ 1\ 0\ 0),\ (0\ 1\ 1\ 1)\big]$

/en/Coding/The core of the matrix (simple), Internal name: **ZBkeriZ**,

Name:

Var.:**223.** Group: Day/Mo/Year:

Find a basis of the kernel of a matrix over a field F_2:

$$\begin{pmatrix} 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 \end{pmatrix}$$

Answer:

223: $\big[(0x_3 + 1x_4,\ 0x_3 + 1x_4,\ x_3, x_4)\big]$

16 Cryptography.

/en/Cryptography/A small fraction, Internal name: **ZBigFraciZ**,

Name:

Var.:**224.** Group: Day/Mo/Year:

Write the answer in the form of an irreducible fraction.

$$\frac{121}{95} - \frac{44}{35} = \quad \frac{(\qquad\qquad)}{(\qquad\qquad)}$$

224: $\big[11/665\big]$

/en/Cryptography/Fractions Are Large, Internal name: **ZBigFraciiZ**,

Name:

Var.:**225.** Group: Day/Mo/Year:

Write the answer in the form of an irreducible fraction.

$$\frac{40913}{59881} - \frac{39156}{57311} = \quad \frac{(\qquad\qquad)}{(\qquad\qquad)}$$

225: $\big[251/13353463\big]$

/en/Cryptography/Inverse number, Internal name: **ZobratzZ**,

Name:

Var.:**226.** Group: Day/Mo/Year:

Solve the equation in $\mathbb{Z}_{2293}$:
$286 \cdot x + 1367 = 0$

Answer:

226: $\big[x = 1270\big]$

/en/Cryptography/Inverse number (Prime), Internal name: **Zobratz1Z**,

Name:

Var.:**227.** Group: Day/Mo/Year:

Solve the equation in $\mathbb{Z}_{28}$:
$25 \cdot x + 10 = 0$

Answer:

227: $\big[x = 22\big]$

/en/Cryptography/Inverse number (very simple), Internal name: **Zobratz2Z**,

Name:

Var.:**228.** Group: Day/Mo/Year:

Solve the equation in $\mathbb{Z}_{100}$:
$89 \cdot x + 51 = 0$

Answer:

228: $\big[x = 41\big]$

/en/Cryptography/Encryption backpack, Internal name: **ZrukzakiZ**,

Name:

Var.:**229.** Group: Day/Mo/Year:

The secret key for cryptography based on the backpack packing is given: (7541, 10000 and 35 73 155 310 621 1247) (1) Decrypt encryption 21789, (2) to generate the corresponding public key to encrypt, (3) encrypt message 110010.

Answer:

229:[b=61; Key=2135 4453 9455 8910 7881 6067 ; Crypt=14469; Mess=011010;]

/en/Cryptography/Encryption by backpack (with hint), Internal name: **ZrukzakiiZ**,

Name:

Var.:**230.** Group: Day/Mo/Year:

The secret key for cryptography based on the backpack packing is given: (9867, 10000 and 34 73 153 311 622 1245) (1) Decrypt encryption 12854, (2) to generate the corresponding public key to encrypt, (3) encrypt message 101010. (Hint: $10000 \cdot (8680) + 9867 \cdot (-8797) = 1$)

Answer:

230:[b=1203; Key=902 7819 4059 4133 8266 7735 ; Crypt=13227; Mess=110100;]

/en/Cryptography/Chinese theorem on residues (small), Internal name: **ZChainTheoriZ**, Find a match in The Chinese theorem but the numbers are small, you can search through.

Name:

Var.:**231.** Group: Day/Mo/Year:

Given the isomorphism: $Z_7 \times Z_{11} \to Z_{77}$. Find a match: (;) $\to$ (75) and $(4; 8) \to$ ( ).

231:[$(\mathbf{5}; \mathbf{9}) \to (75)$, $(4; 8) \to (\mathbf{74})$]

/en/Cryptography/The Chinese theorem on residues, Internal name: **ZChainTheorZ**, Find a match in The Chinese theorem. The numbers are average, you need a calculator.

Name:

Var.:**232.** Group: Day/Mo/Year:

Given the isomorphism: $Z_{53} \times Z_{59} \to Z_{3127}$. Find a match: (;) $\to$ (1109) and $(25; 55) \to$ ( ).

232:[$(\mathbf{49}; \mathbf{47}) \to (1109)$, $(25; 55) \to (\mathbf{2887})$]

/en/Cryptography/RSA, Internal name: **ZrsaZ**,

Name:

Var.:**233.** Group: Day/Mo/Year:

Solve the equation $x^3 = 38471$ in $\mathbb{Z}_{74299}$.
(Hint: $74299 = 191 \cdot 389$, 191 and 389 — Prime number, $191 \cdot (222) + 389 \cdot (-109) = 1$, $54^{38} \,\%\, 191 = 184$, $47^{50} \,\%\, 389 = 276$, $349^{259} \,\%\, 389 = 47$, $80^{193} \,\%\, 191 = 120$, $349^{355} \,\%\, 389 = 108$, $80^{105} \,\%\, 191 = 121$, $80^{127} \,\%\, 191 = 54$, $349^{413} \,\%\, 389 = 43$.)

Answer:

233:[436]

/en/Cryptography/RSA (simple), Internal name: **ZrsaiZ**,

Name:

Var.:**234.** Group: Day/Mo/Year:

Solve the equation $x^3 = 158$ in $\mathbb{Z}_{187}$.
(Hint: $187 = 17 \cdot 11$, 17 and 11 — Prime number, $17 \cdot (-9) + 11 \cdot (14) = 1$, $5^{11} \,\%\, 17 = 11$, $4^7 \,\%\, 11 = 5$.)

Answer:

234:[181]

/en/Cryptography/RSA (without hint), Internal name: **ZrsatZ**,

Name:

Var.:**235.** Group: Day/Mo/Year:

Solve the equation $x^3 = 36$ in $\mathbb{Z}_{187}$.
(Hint: $187 = 11 \cdot 17$, 11 and 17 — Prime number.)

Answer:

235:[42]

/en/Cryptography/El Gammal Encryption, Internal name: **ZElGamalcZ**,

Name:

Var.:**236.** Group: Day/Mo/Year:

The El Gammal cryptosystem withZ_{31} and $g = 3$ is given. Here is the table of degrees:

	0	1	2	3	4	5	6	7	8	9
0*		3	9	27	19	26	16	17	20	29
1*	25	13	8	24	10	30	28	22	4	12
2*	5	15	14	11	2	6	18	23	7	21

Secret key: 27.
1. Decrypt: crypt: 15, hint: 9.
Answer: ( )
2. Generate the public key. Answer: ( )
3. Encrypt message 22 (as random numbers use 4).
Answer: Crypt: ( ), Hint: ( ).

236:[Message: 23, public key: 23 Crypt: (26, 19).]

/en/Cryptography/Signed By El Gammal, Internal name: **ZElGamalsZ**,

Name:

Var.:**237.** Group: Day/Mo/Year:

The El Gammal cryptosystem withZ_{31} and $g = 3$ is given. Here is the table of degrees:

	0	1	2	3	4	5	6	7	8	9
0*		3	9	27	19	26	16	17	20	29
1*	25	13	8	24	10	30	28	22	4	12
2*	5	15	14	11	2	6	18	23	7	21

Secret key: 23.
Sign message 10 (as random numbers use 13).
Answer: Sign: ( ), hint: ( ).

237: [(14, 24).]

17 Differential equation. Here are the differential equations.

/en/Differential equation/Approximate solution, Internal name: **ZpriblduZ**,

Name:

Var.:**238.** Group: Day/Mo/Year:

Find an approximate solution to the Cauchy problem:
$y''' = 2 \cdot y' \cdot y + 5 \cdot y'' \cdot x$,
$y(3) = 5, y'(3) = 9, y''(3) = -4$. Write the answer in the form of a series of Taylor to the fourth power of the summand inclusive.

Answer:

238: $\left[y = 5+9\cdot(x-3)-2\cdot(x-3)^2+5\cdot(x-3)^3+23\cdot(x-3)^4\right]$

/en/Differential equation/Simple Cauchy task, Internal name: **ZkoshiZ**,

Name:

Var.:**239.** Group: Day/Mo/Year:

Solve the Cauchy problem: $x \cdot y' + 5 = y$, $y(-2) = 17$.

Answer:

239: $\left[y = -6x + 5\right]$

/en/Differential equation/Integrating factor, Internal name: **ZIntMnozhZ**,

Name:

Var.:**240.** Group: Day/Mo/Year:

Find the General solution of the differential equation

$$(-9 \cdot x^4 \cdot y^5 - 8 \cdot x^5)\, dx + (-15 \cdot x^5 \cdot y^4)\, dy = 0$$

Answer:

240: $\left[-3x^3y^5 - 2x^4 = c,\ x^{-2}\right]$

/en/Differential equation/Linear first order, Internal name: **ZlinduiZ**,

Name:

Var.:**241.** Group: Day/Mo/Year:

Find the General solution of the differential equation: $y' = \dfrac{y - 9 \cdot x - 6}{x - 7}$

Answer:

241: $\left[y = -9(x-7)ln(x-7) + C(x-7) + 69\right]$

/en/Differential equation/Linear homogeneous with post 2nd order coefficient, Internal name: **Zlopk2Z**,

Name:

Var.:**242.** Group: Day/Mo/Year:

Find the General solution of the differential equation:
$y'' + 4 \cdot y' + 3 \cdot y = 0$

Answer:

242: $\left[C_1 \cdot e^{-1x} + C_3 \cdot e^{-3x}\right]$

/en/Differential equation/Linear homogeneous with post coefficient of the 3rd order, Internal name: **Zlopk3Z**,

Name:

Var.:**243.** Group: Day/Mo/Year:

Find the General solution of the differential equation:
$y''' + 6 \cdot y'' + 9 \cdot y' + 4 \cdot y = 0$

Answer:

243: $\left[C_1 \cdot e^{-1x} + C_2 \cdot x \cdot e^{-1x} + C_3 \cdot e^{-4x}\right]$

/en/Differential equation/Linear mixed post coeff 2nd order, Internal name: **Zlnpk2Z**,

Name:

Var.:**244.** Group: Day/Mo/Year:

Find the General solution of the differential equation:
$y'' - 6 \cdot y' + 9 \cdot y = 36 \cdot x^2 - 48 \cdot x - 10$

Answer:

244: $\left[C_1 \cdot e^{3x} + C_2 \cdot x \cdot e^{3x} + (4 \cdot x^2 - 2)\right]$

/en/Differential equation/Linear mixed post coeff complex, Internal name: **ZlnpkiZ**,

Name:

Var.:**245.** Group: Day/Mo/Year:

Find the General solution of the differential equation:
$y'' + 3 \cdot y' + 2 \cdot y = 18 \cdot e^{1x} + 10 \cdot \sin(1x)$

Answer:

245: $\left[C_1 \cdot e^{-2x} + C_2 \cdot e^{-1x} + \left(3 \cdot e^{1x} - 3 \cdot \cos(1x) + 1 \cdot \sin(1x)\right)\right]$

/en/Differential equation/The linear non-uniform post-coefficient is very complex, Internal name: **Zlnpkii Z**,

Name:

Var.:**246.** Group: Day/Mo/Year:

Find the General solution of the differential equation:
$y'' - y' - 6 \cdot y = -24 \cdot x - 34 - 20 \cdot e^{3x}$

Answer:

246: $\left[C_1 \cdot e^{-2x} + C_2 \cdot e^{3x} + \left(4 \cdot x + 5 - 4 \cdot x \cdot e^{3x}\right)\right]$

/en/Differential equation/Linear inhomogeneous with post factors is very complex 2, Internal name: **ZlnpkiiiZ**,

Name:

Var.:**247.** Group: Day/Mo/Year:

Find the General solution of the differential equation:
$y'' + 2 \cdot y' = -24 \cdot x^2 - 44 \cdot x - 14$

Answer:

247: $\left[C_1 \cdot e^{-2x} + C_2 + \left(-4 \cdot x^3 - 5 \cdot x^2 - 2 \cdot x\right)\right]$

/en/Differential equation/Homogeneous first order, Internal name: **ZodnordifuriZ**,

Name:

Var.:**248.** Group: Day/Mo/Year:

Find the partial solution of the differential equation $x \cdot y \cdot y' = 9 \cdot y^2 - 64 \cdot x^2$, satisfying the condition $y(1) = 7$

Answer:

248: $\left[y = \sqrt{8 \cdot x^2 + 41 \cdot x^{18}}\ \right]$

/en/Differential equation/Allowing the reduction, Internal name: **ZdifurUmenStepZ**,

Name:

Var.:**249.** Group: Day/Mo/Year:

Find the General solution of the differential equation:
$y \cdot y'' = 10(y')^2 - (y')^3$

Answer:

249: $\left[y + \frac{C_1}{y^9} = 10x + C_2\right]$

/en/Differential equation/Bernulli, Internal name: **ZbernulliZ**,

Name:

Var.:**250.** Group: Day/Mo/Year:

Find the General solution of

$$y' = 4 \cdot y + e^{-1 \cdot x} \cdot y^{-3}$$

Answer:

250: $\left[y^4 = C \cdot e^{16 \cdot x} + \frac{-4}{17} \cdot e^{-1 \cdot x}\right]$

/en/Differential equation/Bernulli with answer, Internal name: **ZbernullimZ**, Moodle computable

Name:

Var.:**251.** Group: Day/Mo/Year:

Find the General solution of

$$y' = 3 \cdot y + e^{4 \cdot x} \cdot y^{-2}$$

1. $y^3 = C \cdot e^{9 \cdot x} + \frac{2}{5} \cdot e^{4 \cdot x}$
2. $y^2 = C \cdot e^{-6 \cdot x} + \frac{2}{5} \cdot e^{4 \cdot x}$
3. $y^2 = C \cdot e^{-6 \cdot x} + \frac{2}{5} \cdot e^{4 \cdot x}$
4. $y^3 = C \cdot e^{9 \cdot x} + \frac{-3}{5} \cdot e^{4 \cdot x}$

Answer:

251: $\left[4\right]$

/en/Differential equation/Ricatti, Internal name: **ZricattiZ**,

Name:

Var.:**252.** Group: Day/Mo/Year:

Find the General solution of

$$y' = 7 \cdot x^{-5} \cdot y \cdot (y - 4 \cdot x^4) + 16 \cdot x^3$$

Answer:

252: $\left[y = \frac{24}{C \cdot x^{-28} - 7 \cdot x^{-4}} + 4 \cdot x^4\right]$

/en/Differential equation/Ricatti with answer, Internal name: **ZricattimZ**, Moodle computable

Name:

Var.:**253.** Group: Day/Mo/Year:

Find the General solution of

$$y' = -9 \cdot x^1 \cdot y \cdot (y - 4 \cdot x^{-2}) - 8 \cdot x^{-3}$$

1. $y = \frac{34}{C \cdot x^2 + 36 \cdot x^{36}} + 4 \cdot x^{-2}$
2. $y = \frac{34}{C \cdot x^{36} + 4 \cdot x^{-2}} + 4 \cdot x^{-2}$
3. $y = \frac{-34}{C \cdot x^{-2} - 2 \cdot x^{-36}} + 4 \cdot x^{-2}$
4. $y = \frac{-34}{C \cdot x^{36} + 9 \cdot x^2} + 4 \cdot x^{-2}$

Answer:

253:[4]

/en/Differential equation/Lagranj, Internal name: **ZlagranjZ**,

Name:

Var.:**254.** Group: Day/Mo/Year:

Find the General solution of

$$-5 \cdot y = y' \cdot (-10 + 10 \cdot y') \cdot x - 5 \cdot \ln|y'|$$

Answer:

254:[$\left\{ \begin{array}{l} x = (C + \frac{1}{2} \cdot \ln|p + \frac{-1}{2}|) \cdot p^{-2}, \\ y = (2 + -2 \cdot p) \cdot (C + \frac{1}{2} \cdot \ln|p + \frac{-1}{2}|) \cdot p^{-1} + 1 \cdot \ln|p|. \end{array} \right.$]

/en/Differential equation/Lagranj with answer, Internal name: **ZlagranjmZ**, Moodle computable

Name:

Var.:**255.** Group: Day/Mo/Year:

Find the General solution of

$$-1 \cdot y = y' \cdot (-2 + 4 \cdot y') \cdot x + 5 \cdot \ln|y'|$$

1. $\left\{ \begin{array}{l} x = (C + \frac{-5}{4} \cdot \ln|p|) \cdot (2 + -4 \cdot p)^{-2}, \\ y = (C + \frac{-5}{4} \cdot \ln|p|) \cdot p \cdot (2 + -4 \cdot p)^{-1} - 5 \cdot \ln|p|. \end{array} \right.$
2. $\left\{ \begin{array}{l} x = (C + \frac{-3}{2} \cdot \ln|p|) \cdot (2 + -4 \cdot p)^{-2}, \\ y = (C + \frac{-3}{2} \cdot \ln|p|) \cdot p \cdot (2 + -4 \cdot p)^{-1} - 5 \cdot \ln|p|. \end{array} \right.$
3. $\left\{ \begin{array}{l} x = (C + \frac{-5}{4} \cdot \ln|p + \frac{-1}{4}|) \cdot p^{-2}, \\ y = (2 + -4 \cdot p) \cdot (C + \frac{-5}{4} \cdot \ln|p + \frac{-1}{4}|) \cdot p^{-1} - 5 \cdot \ln|p|. \end{array} \right.$
4. $\left\{ \begin{array}{l} x = (C + \frac{-3}{2} \cdot \ln|p + \frac{1}{4}|) \cdot p^{-2}, \\ y = (2 + -4 \cdot p) \cdot (C + \frac{-3}{2} \cdot \ln|p + \frac{-1}{4}|) \cdot p^{-1} - 5 \cdot \ln|p|. \end{array} \right.$

Answer:

255:[3]

18 Theory of probability.

/en/Theory of probability/Full probability and Bayes formula, Internal name: **ZpolverZ**,

Name:

Var.:**256.** Group: Day/Mo/Year:

Probability to pass the exam by answering a simple ticket is 3/4 while answering a difficult is — 1/5. The student chooses a ticket from a pack in which there are 2 simple and 7 difficult tickets.
(1) Find the probability that the student will pass the exam.
(2) it is Known that the student passed the exam, what is the probability that he passed with a simple ticket?

Answer:

256:[1:$\frac{29}{90} = 0.322222$, 2 : $\frac{15}{29} = 0.517241$]

/en/Theory of probability/Formula Bernoulli, Internal name: **ZbernuliZ**,

Name:

Var.:**257.** Group: Day/Mo/Year:

It is known that for the final death, Count Dracula needs at least three silver bullets. Van Helsing is the holder of 8 rounds, and the probability of hitting with every shot is 5/7. Find the probability of the victory of good over evil.

Answer:

257:[0.991296]

/en/Theory of probability/Basket balls, Internal name: **ZterverZ**,

Name:

Var.:**258.** Group: Day/Mo/Year:

In the basket there are 9 white and 5 black balls. From the basket, 6 balls were taken. What is the probability that they are the same color?

Answer:

258:[$\frac{84}{3003} = \frac{4}{143} = 0.028$]

/en/Theory of probability/methods of choice, Internal name: **ZzcnmZ**,

Name:

Var.:**259.** Group: Day/Mo/Year:

How many ways to choose 9 items from 2 items? How many ways are there to choose 9 items from 2 items?

Answer:

259:[36]

/en/Theory of probability/Shooting the hare, Internal name: **ZsumveriZ**,

Name:

Var.:**260.** Group: Day/Mo/Year:

Two shooters shoot one hare. The probability of hitting with first arrow is 0.3 and whith second it is 0.5. What is the probability that the hare will get shot? What is the probability that there will be two holes in the hare?

Answer:

260:[0.65; 0.15]

/en/Theory of probability/Expected value and Variance, Internal name: **ZdiskcviZ**,

Name:

Var.:**261.** Group: Day/Mo/Year:

Random value is given by table

x	4	7	9
p	0.4	0.5	0.1

Find the expected value and variance.

Answer:

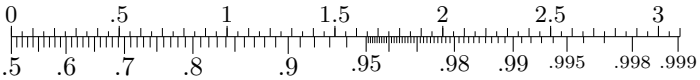
261: $\left[M = 6,\ D = 3\right]$

/en/Theory of probability/Malchish-Kibalchish, Internal name: **ZpulemetZ**,

Name:

Var.:**262.** Group: Day/Mo/Year:

The Boy-Kibalchish has 2550 ammo. Firing accuracy of the revolutionary machine gun Maxim is 0.27. For the death of the Chief Burzhuin, 666 bullets are enough. What is the probability of the victory of the world Revolution?



Answer:

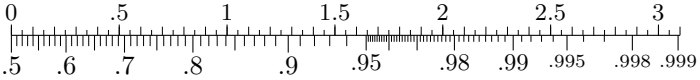
262: $\left[0.842\right]$

/en/Theory of probability/De Moivre Laplace, Internal name: **ZterminatorZ**,

Name:

Var.:**263.** Group: Day/Mo/Year:

It is known that to terminate the Terminator T-1000 is requires 120 hits. The accuracy of the Terminator T-800 is — 0.4. How many shots is it enough to make the Terminator T-800, to terminate his opponent with a probability of 0.91?



Answer:

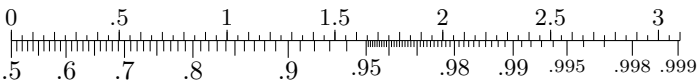
263: $\left[330\right]$

/en/Theory of probability/Confidence interval, Internal name: **ZdovintZ**,

Name:

Var.:**264.** Group: Day/Mo/Year:

Of the 387 conducted, successful experiments ware 185. Find the confidence interval for the probability of success in one experience. (significance level 0.04).



Answer:

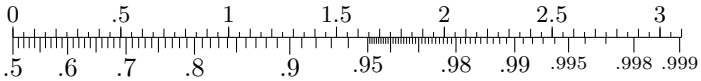
264: $\left[0.433932, 0.522485\right]$

/en/Theory of probability/Confidence interval 1, Internal name: **ZstatiZ**,

Name:

Var.:**265.** Group: Day/Mo/Year:

Produced 5 analyses of a certain substance. Test results: 8.88; 8.91; 9.18; 9.09; 9.18. The standard deviation for this type of analysis is 0.3. Significance level is 97%. Find the confidence interval of the measured value.



Answer:

265: $\left[(8.75704; 9.33896)\right]$

/en/Theory of probability/Confidence interval 2, Internal name: **ZstatiiZ**,

Name:

Var.:**266.** Group: Day/Mo/Year:

5 experiments were made. Results: 3.09; 2.92; 2.92; 3.01; 2.91. Significance level: 95%. Find the sample average, corrected standard deviation and confidence interval of the measured value.

Answer:

266: $\left[2.97; 0.0876784;\ (2.87405; 3.06595)\right]$

/en/Theory of probability/Sample mean, Internal name: **ZvibsredZ**,

Name:

Var.:**267.** Group: Day/Mo/Year:

The variation series is given: $1; 3; 7; 10; 14$. Find the sample average.

Answer:

267: $\left[7\right]$

/en/Theory of probability/Parameter in the density function, Internal name: **ZtvFplotniZ**,

Name:

Var.:**268.** Group: Day/Mo/Year:

The density function of some random variable is given:

$$f(x) = \begin{cases} 0, & x \notin [1; 6] \\ c \cdot x, & x \in [1; 6] \end{cases}$$

Find the value of the c parameter. Find the distribution function.

Answer:

268: $\left[\frac{2}{35} \approx 0.057\right]$

/en/Theory of probability/The expected value of a continuous random variable, Internal name: **ZtvMatOnsviZ**,

Name:

Var.:**269.** Group: Day/Mo/Year:

The density function of some random variable is given:

$$F(x) = \begin{cases} 0, & x \leqslant -2 \\ \frac{x^2-4}{5}, & -2 < x \leqslant 3 \\ 1, & x > 3 \end{cases}$$

Find the expectation.

Answer:

269: $\left[\frac{14}{3} \approx 4.667\right]$

19 Graph theory.

/en/Graph theory/The problem of the appointment of 3x3, Internal name: **Zkanmun3Z**,

Name:

Var.:**270.** Group: Day/Mo/Year:

Solve the problem of optimal assignment. Specify the final layout of the vertices.

	d	e	f	
a	13	12	7	a —
b	9	13	4	b —
c	12	16	12	c —
				$\sum$ =

270: $\left[\sum = 38,\ \text{ad, be, cf}\right]$

/en/Graph theory/The problem of the appointment of 4x4, Internal name: **Zkanmun4Z**,

Name:

Var.:**271.** Group: Day/Mo/Year:

Solve the problem of optimal assignment. Specify the final layout of the vertices.

	e	f	g	h	
a	13	7	15	14	a —
b	6	3	13	9	b —
c	8	6	14	12	c —
d	11	13	18	15	d —
					$\sum$ =

271: $\left[\sum = 51,\ \text{ae, bg, ch, df}\right]$

/en/Graph theory/The problem of the appointment of 5x5, Internal name: **Zkanmun5Z**,

Name:

Var.:**272.** Group: Day/Mo/Year:

Solve the problem of optimal assignment. Specify the final layout of the vertices.

	f	g	h	i	j	
a	9	13	11	8	11	a —
b	5	12	4	2	8	b —
c	11	12	6	6	12	c —
d	8	13	4	4	11	d —
e	11	21	10	13	17	e —
						$\sum$ =

272: $\left[\sum = 58,\ \text{ah, bg, cf, dj, ei}\right]$

/en/Graph theory/The problem of the appointment of 6x6, Internal name: **Zkanmun6Z**,

Name:

Var.:**273.** Group: Day/Mo/Year:

Solve the problem of optimal assignment. Specify the final layout of the vertices.

	g	h	i	j	k	l	
a	15	20	9	12	5	6	a —
b	14	23	10	18	7	11	b —
c	22	18	18	16	11	14	c —
d	29	31	16	26	19	21	d —
e	24	21	18	18	15	19	e —
f	19	20	11	12	6	10	f —
							$\sum$ =

273: $\left[\sum = 113,\ \text{ah, bj, ci, dk, el, fg}\right]$

/en/Graph theory/The problem of the appointment of 7x7, Internal name: **Zkanmun7Z**,

Name:

Var.:**274.** Group: Day/Mo/Year:

Solve the problem of optimal assignment. Specify the final layout of the vertices.

	h	i	j	k	l	m	n
a	14	25	9	17	9	19	22
b	23	24	13	21	15	30	29
c	13	27	9	22	13	27	18
d	19	35	23	30	18	40	24
e	23	30	19	20	24	33	23
f	9	24	5	11	9	23	18
g	9	17	5	13	7	24	13

a —
b —
c —
d —
e —
f —
g —
$\sum =$

274: $\left[\sum = 162,\ \text{an, bh, ck, dj, el, fi, gm}\right]$

/en/Graph theory/Ford-Falkerson, Internal name: **ZffZ**,

Name:

Var.:**275.** Group: Day/Mo/Year:

The "system of roads" with the specified capacity connecting the cities s and t is given. Using the Ford-Falkerson algorithm, find the maximum flow and prove that it is indeed the maximum. $s^{(6,\to)}a$, $s^{(7,\to)}b$, $s^{(6,\to)}c$, $a^{(4,\to)}e$, $a^{(1,\to)}i$, $b^{(3,\to)}e$, $b^{(1,\to)}g$, $c^{(2,\to)}e$, $c^{(1,\to)}f$, $e^{(3,\to)}g$, $e^{(4,\to)}h$, $f^{(2,\to)}h$, $f^{(2,\to)}i$, $g^{(6,\to)}t$, $h^{(7,\to)}t$, $i^{(6,\to)}t$,
flow=

275: $[]$

20 Financial calculations.

/en/Financial calculations/Size of payments, Internal name: **ZrazmviplZ**,

Name:

Var.:**276.** Group: Day/Mo/Year:

Someone plans to buy an apartment in 205000 in 8 years. What amount should he or she put into his or her Bank account monthly if the annual Bank rate is 12%?

Answer:

276: $\left[1317.92\right]$

/en/Financial calculations/Mission, Internal name: **ZkomandirZ**,

Name:

Var.:**277.** Group: Day/Mo/Year:

Nothing

Answer:

277: $\left[12107.5\right]$

/en/Financial calculations/Purchase, Internal name: **ZpokupkvZ**,

Name:

Var.:**278.** Group: Day/Mo/Year:

Someone plans to buy an apartment in 339000 in 6 years. What amount should he or she put into his or her Bank account monthly if the annual Bank rate is 9%?

Answer:

278: $\left[3608.45\right]$

/en/Financial calculations/Rent replacement 1, Internal name: **ZrentaiZ**,

Name:

Var.:**279.** Group: Day/Mo/Year:

Replace the semi-annual rent with payment 1300 and duration 10 years with quarterly duration 7 years. Annual rate 14%. Interest is charged 4 once a year at regular intervals.

Answer:

279: $\left[772.177\right]$

/en/Financial calculations/Rent replacement 2, Internal name: **ZrentaiiZ**,

Name:

Var.:**280.** Group: Day/Mo/Year:

Replace the annual rent with payment 1900 and duration 9 years semi-annual with payment 1600. Annual rate 13%. Interest is charged 4 once a year at regular intervals.

Answer:

280: $\left[15.6105\right]$

/en/Financial calculations/Rates and inflation, Internal name: **ZinflstavZ**,

Name:

Var.:**281.** Group: Day/Mo/Year:

The Bank announced the Deposit 13 % per annum. The real rate at the end of the year is 6.5 %. Find quarterly inflation.

Answer:

281: $\left[1.49209\right]$

/en/Financial calculations/Rates and inflation 1, Internal name: **Zinflstav1Z**,

Name:

Var.:**282.** Group: Day/Mo/Year:

The Bank announced the Deposit 19 % per annum. The expected rate of inflation 2 %. Find the real annual rate for the Bank's client.

Answer:

282: $\left[9.93761\right]$

/en/Financial calculations/Rates and inflation 2, Internal name: **Zinflstav2Z**,

Name:

Var.:**283.** Group: Day/Mo/Year:

The Bank announced the Deposit 17 % per annum. The real rate at the end of the year is 4 %. Find quarterly inflation.

Answer:

283: $\left[2.98836\right]$

/en/Financial calculations/Rates and inflation 3, Internal name: **Zinflstav3Z**,

Name:

Var.:**284.** Group: Day/Mo/Year:

The real interest rate on the Deposit at the end of the year was 5 %. Quarterly inflation 1.5 %. Find the nominal rate appointed by the Bank.

Answer:

284: $\left[6.13636\right]$

/en/Financial calculations/What is more profitable, Internal name: **ZchtovZ**,

Name:

Var.:**285.** Group: Day/Mo/Year:

Find modern amounts and find out what amount is more profitable: (1) 1073 within two years to date or (2) 1857 5 years after today. Annual compound interest rate 2%.

Answer:

285: $\left[A1 = 1116.35,\ B1 = 1681.94\right]$

/en/Financial calculations/Annual interest, Internal name: **ZgodprZ**,

Name:

Var.:**286.** Group: Day/Mo/Year:

The Bank promises 4.5% in 120 days. How much will it be per annum? (In year considered 365 days.)

Answer:

286: $\left[14.3261\right]$

21 Game theory.

/en/Game theory/Pure strategy, Internal name: **ZClnGameZ**, search is solved by the minimax and Maximin

Name:

Var.:**287.** Group: Day/Mo/Year:

Given matrix wins a zero-sum game:

$$\begin{array}{rrrrrrr} 1 & -6 & -8 & -4 & -7 & 7 & 9 \\ -7 & -8 & -8 & 8 & 7 & 4 & 4 \\ 3 & 3 & -3 & 1 & 4 & -1 & 9 \\ -2 & 6 & -4 & 3 & 8 & -2 & -2 \end{array}$$

Is there a solution in pure strategies (Yes/no)? If there is, find the price of the game.

Answer:

287: $\left[-3,\ (3, 3)\right]$

/en/Game theory/Dominant strategies, Internal name: **ZDomGameZ**, First remove the dominant, then 2x2 picture

Name:

Var.:**288.** Group: Day/Mo/Year:

Given matrix wins a zero-sum game: $\begin{pmatrix} 4 & 10 & 12 \\ 5 & 6 & 6 \\ 6 & 5 & 4 \end{pmatrix}$

To find the optimal strategy and the price of the game.

Answer:

288: $\left[\text{ The strategy of the left of the player: } (\ \frac{1}{5}\ 0\ \frac{4}{5}\ ),\ \text{Strategy the top player: } (\ \frac{4}{5}\ 0\ \frac{1}{5}\ )\ \text{price games: } \frac{28}{5}\right]$

/en/Game theory/Mixed strategy, Internal name: **ZgamethiZ**, 2x3, solved by picture

Name:

Var.:**289.** Group: Day/Mo/Year:

Find the solution to the game in mixed strategies.
$\begin{pmatrix} -6 & 2 & -3 \\ 4 & -6 & -2 \end{pmatrix}$

Answer:

289: $\left[\frac{-22}{9},\ (\frac{4}{9}, \frac{5}{9}),\ (0, \frac{1}{9}, \frac{8}{9})\right]$

22 Linear programming.

/en/Linear programming/The simplex method is complex, Internal name: **Zsimpl1Z**,

Name:

Var.:**290.** Group: Day/Mo/Year:

Solve the problem of linear programming:
$L(x) = 2 \cdot x_1 - 3 \cdot x_2 - 5 \cdot x_3 \to max$
$\begin{cases} x_1 - 1 \cdot x_2 + x_3 = 3 \\ -2 \cdot x_1 + 3 \cdot x_2 \leqslant 6 \\ -1 \cdot x_1 + 2 \cdot x_2 \geqslant 2 \end{cases}$
$x_1 \geqslant 0,\ x_2 \geqslant 0,\ x_3 \geqslant 0.$

Answer:

290: $\big[(8, 5, 0, 7, 0, 0),\ L(x) = 1\big]$

/en/Linear programming/Transport problem, Internal name: **ZtransiZ**,

Name:

Var.:**291.** Group: Day/Mo/Year:

Goods from warehouses A_1, A_2, A_3 are delivered to consumers B_1, B_2, B_3. Prices of transportation of goods are shown in the table:

	$A_1 = 10$	$A_2 = 30$	$A_3 = 50$
$B_1 = 20$	18	8	9
$B_2 = 40$	20	12	14
$B_3 = 30$	10	6	7

Make a transportation plan in which the transport costs are minimal and find these costs.

291: $\big[x_{ij} = \begin{pmatrix} 0 & 0 & 20 \\ 0 & 30 & 10 \\ 10 & 0 & 20 \end{pmatrix},\ L = 920\big]$

/en/Linear programming/Dual problem, Internal name: **ZsimpliZ**,

Name:

Var.:**292.** Group: Day/Mo/Year:

Write a dual problem to the problem of linear programming and solve it graphically. Restore the solution to the original problem.
$L(x) = 5 \cdot x_1 + 5 \cdot x_2 + 11 \cdot x_3 - 9 \cdot x_4 \to max$
$\begin{cases} 4x_1 + 1x_2 + 2x_3 + 2x_4 = -6 \\ 3x_1 + 2x_2 + 3x_3 - 1x_4 \leqslant -29 \end{cases}$
$x_1 \geqslant 0,\ x_2 \geqslant 0,\ x_4 \geqslant 0.$

Answer:

292: $\big[X = (0, 0, -8, 5),\ Y = (-2, 5),\ L = -133\big]$

/en/Linear programming/Graphical method, Internal name: **ZoptplanZ**,

Name:

Var.:**293.** Group: Day/Mo/Year:

For the production of 2 types of goods a and B requires 3 types of resources. The consumption of each resource for the production of a unit of goods and the monthly supply of this resource is given in the table

	A	B	monthly supply
I	2	1	25
II	8	8	128
III	10	7	141

The profit from selling unit a is 9. and with sale item B is 6. Find the (1) monthly plan for the release of goods, giving the maximum income and (2) this maximum income. (3) Is it possible to reduce the stock of one of the resources without changing the optimal plan, and by how much?
Answer: (1):
(2):
(3):

293: $\big[(9, 7),\ 123,\ 3 - 2\big]$

/en/Linear programming/Graphical method beautiful, Internal name: **ZLPgrfiZ**,

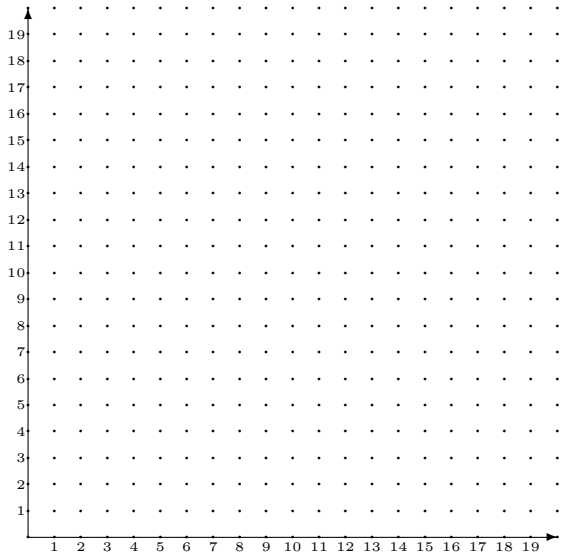
Name:

Var.:**294.** Group: Day/Mo/Year:

For the production of two types of goods A and B requires three types of resources. The consumption of each resource for the production of a unit of goods and the monthly supply of this resource is shown in the table

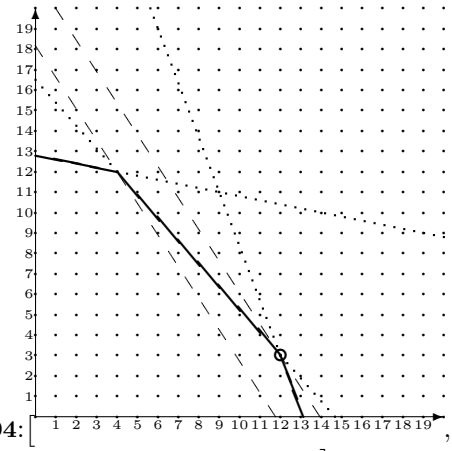
	A	B	monthly supply
I	9	8	132
II	1	5	64
III	8	3	105

Profit from the sale of unit A is 34 and from the sale of unit B is 22. Solve the problem by graphical method.

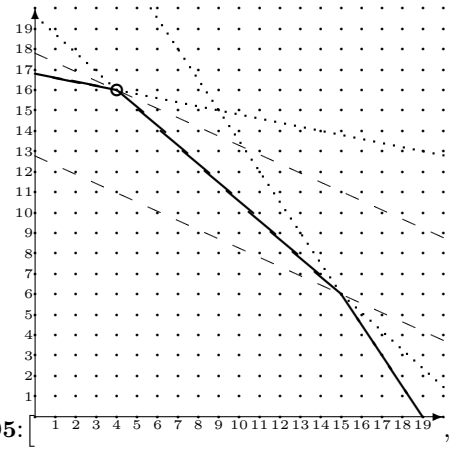


To find the monthly production plan of the products giving the maximum revenue and the maximum revenue.

Answer:



294:[A – 12, B – 3, Profit – 474.]



295:[$x_i = (4; 16)$, $L(x) = L(y) = 552$, $y_i = (1; 4; 0)$]

/en/Linear programming/Graphic dual problem, Internal name: **ZLPgrfiiZ**,

Name:

Var.:**295.** Group: Day/Mo/Year:

The problem of linear programming is given:

$L(y) = 216 \cdot y_1 + 84 \cdot y_2 + 57 \cdot y_3 \to min$

$$\begin{cases} 10 \cdot y_1 \quad + y_2 + 3 \cdot y_3 \geqslant 14 \\ 11 \cdot y_1 + 5 \cdot y_2 + 2 \cdot y_3 \geqslant 31 \end{cases}$$

$y_i \geqslant 0$.

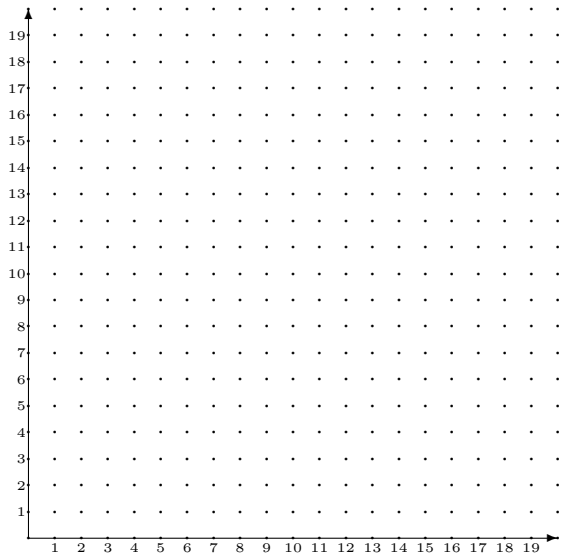
Formulate the dual problem:

$L(x) =$ $\to max$

$$\begin{cases} \\ \\ \\ \\ \\ \end{cases}$$

$x_i \geqslant 0$.

Solve it by geometric method:



Answer: $x_1 =$, $x_2 =$, $L(x) =$

By solving the dual problem to find a solution to the direct problem:

Answer: $y_1 =$, $y_2 =$, $y_3 =$

/en/Linear programming/Only dual 3x3, Internal name: **ZLP33dZ**,

Name:

Var.:**296.** Group: Day/Mo/Year:

The problem of linear programming

$L(x) = 20 \cdot x_1 + 45 \cdot x_2 + 6 \cdot x_3 \to max$

$$\begin{cases} 3 \cdot x_1 + 7 \cdot x_2 + 2 \cdot x_3 \leqslant 44 \\ 7 \cdot x_1 + 3 \cdot x_2 + 2 \cdot x_3 \leqslant 41 \\ x_1 + 2 \cdot x_2 + 3 \cdot x_3 \leqslant 13 \end{cases}$$

$x_i \geqslant 0$

and its solution is given: $x_1 = 3$; $x_2 = 5$; $x_3 = 0$.

Formulate the dual problem

$L(t) =$ $\to min$

$$\begin{cases} \\ \\ \\ \\ \\ \end{cases}$$

$t_i \geqslant 0$

and find its solution.

Answer:

296:[$t_1 = 5$; $t_2 = 0$; $t_3 = 5$; $max = min = 285$]

/en/Linear programming/Dual 4x4 only, Internal name: **ZLP44dZ**,

Name:

Var.:**297.** Group: Day/Mo/Year:

The problem of linear programming
$L(x) = 7 \cdot x_1 + 19 \cdot x_2 + 9 \cdot x_3 + x_4 \to max$
$\begin{cases} x_1 + 2 \cdot x_2 + 5 \cdot x_3 + 3 \cdot x_4 \leqslant 27 \\ 2 \cdot x_1 + 2 \cdot x_2 + x_3 + 2 \cdot x_4 \leqslant 11 \\ 2 \cdot x_1 + 9 \cdot x_2 + 4 \cdot x_3 + x_4 \leqslant 48 \\ 3 \cdot x_1 + 4 \cdot x_2 + 5 \cdot x_3 + x_4 \leqslant 36 \end{cases}$
$x_i \geqslant 0$
and its solution is given: $x_1 = 0$; $x_2 = 4$; $x_3 = 3$; $x_4 = 0$.
Formulate the dual problem

$L(t) = \qquad \to min$

$\begin{cases} \\ \\ \\ \\ \\ \end{cases}$
$t_i \geqslant 0$
and find its solution.

Answer:

297: $\left[t_1 = 0;\ t_2 = 5;\ t_3 = 1;\ t_4 = 0;\ max = min = 103\right]$

/en/Linear programming/Simplex method 2x2 simple, Internal name: **ZLP22Z**,

Name:

Var.:**298.** Group: Day/Mo/Year:

Solve the direct and dual linear programming problem.
$L(x) = 4 \cdot x_1 + 2 \cdot x_2 \to max$
$\begin{cases} x_1 + 6 \cdot x_2 \leqslant 34 \\ 3 \cdot x_1 + x_2 \leqslant 5 \end{cases}$
$x_i \geqslant 0.$

Answer:

298: $\left[x_1 = 0;\ x_2 = 5;\ t_1 = 0;\ t_2 = 2;\ max = 10\right]$

/en/Linear programming/The simplex method for a simple 3x3, Internal name: **ZLP33Z**,

Name:

Var.:**299.** Group: Day/Mo/Year:

Solve the direct and dual linear programming problem.
$L(x) = 18 \cdot x_1 + 40 \cdot x_2 + 2 \cdot x_3 \to max$
$\begin{cases} 4 \cdot x_1 + 9 \cdot x_2 + 3 \cdot x_3 \leqslant 65 \\ x_1 + 2 \cdot x_2 + x_3 \leqslant 15 \\ x_1 + 5 \cdot x_2 + x_3 \leqslant 36 \end{cases}$
$x_i \geqslant 0.$

Answer:

299: $\left[x_1 = 5;\ x_2 = 5;\ x_3 = 0;\ t_1 = 4;\ t_2 = 2;\ t_3 = 0;\ max = 290\right]$

/en/Linear programming/The simplex method is a simple 4x4, Internal name: **ZLP44Z**,

Name:

Var.:**300.** Group: Day/Mo/Year:

Solve the direct and dual linear programming problem.
$L(x) = 17 \cdot x_1 + 11 \cdot x_2 + 12 \cdot x_3 + 7 \cdot x_4 \to max$
$\begin{cases} x_1 + 3 \cdot x_2 + x_3 + x_4 \leqslant 9 \\ 3 \cdot x_1 + 2 \cdot x_2 + 2 \cdot x_3 + 3 \cdot x_4 \leqslant 23 \\ 2 \cdot x_1 + 3 \cdot x_2 + 4 \cdot x_3 + x_4 \leqslant 30 \\ x_1 + 3 \cdot x_2 + 3 \cdot x_3 + x_4 \leqslant 23 \end{cases}$
$x_i \geqslant 0.$

Answer:

300: $\left[x_1 = 5;\ x_2 = 0;\ x_3 = 4;\ x_4 = 0;\ t_1 = 2;\ t_2 = 5;\ t_3 = 0;\ t_4 = 0;\ max = 133\right]$

/en/Linear programming/The simplex method is a simple 5x5, Internal name: **ZLP55Z**,

Name:

Var.:**301.** Group: Day/Mo/Year:

Solve the direct and dual linear programming problem.
$L(x) = 9 \cdot x_1 + 22 \cdot x_2 + 3 \cdot x_3 + 15 \cdot x_4 + 20 \cdot x_5 \to max$
$\begin{cases} 3 \cdot x_1 + x_2 + x_3 + 3 \cdot x_4 + 2 \cdot x_5 \leqslant 25 \\ x_1 + 3 \cdot x_2 + 2 \cdot x_3 + 2 \cdot x_4 + 2 \cdot x_5 \leqslant 26 \\ x_1 + 2 \cdot x_2 + x_3 + 3 \cdot x_4 + 3 \cdot x_5 \leqslant 34 \\ x_1 + x_2 + 2 \cdot x_3 + x_4 + x_5 \leqslant 11 \\ 3 \cdot x_1 + 3 \cdot x_2 + 3 \cdot x_3 + 2 \cdot x_4 + 3 \cdot x_5 \leqslant 31 \end{cases}$
$x_i \geqslant 0.$

Answer:

301: $\left[x_1 = 0;\ x_2 = 4;\ x_3 = 0;\ x_4 = 2;\ x_5 = 5;\ t_1 = 0;\ t_2 = 2;\ t_3 = 0;\ t_4 = 1;\ t_5 = 5;\ max = 218\right]$

/en/Linear programming/The simplex method is a simple 3x5, Internal name: **ZLP35Z**,

Name:

Var.:**302.** Group: Day/Mo/Year:

Solve the direct and dual linear programming problem.
$L(x) = 41 \cdot x_1 + 18 \cdot x_2 + 18 \cdot x_3 + 22 \cdot x_4 + 9 \cdot x_5 \to max$
$\begin{cases} 2 \cdot x_1 + 3 \cdot x_2 \quad + x_3 + 3 \cdot x_4 + 2 \cdot x_5 \leqslant 18 \\ 7 \cdot x_1 + 3 \cdot x_2 + 3 \cdot x_3 + 3 \cdot x_4 + 2 \cdot x_5 \leqslant 60 \\ 2 \cdot x_1 + 2 \cdot x_2 + 2 \cdot x_3 + 3 \cdot x_4 + 3 \cdot x_5 \leqslant 29 \end{cases}$
$x_i \geqslant 0$.

Answer:

302: $\left[x_1 = 6;\ x_2 = 0;\ x_3 = 6;\ x_4 = 0;\ x_5 = 0;\ t_1 = 3;\ t_2 = 5;\ t_3 = 0;\ max = 354\right]$

23 Economic and mathematical methods.

/en/Economic and mathematical methods/Demand point, Internal name: **ZeconomZ**,

Name:

Var.:**303.** Group: Day/Mo/Year:

nothing

Answer:

303: $\left[(4, 1, 14)\right]$

/en/Economic and mathematical methods/Suppliers and traders, Internal name: **ZmekoniZ**,

Name:

Var.:**304.** Group: Day/Mo/Year:

Suppliers and traders decided to unite in one company. The company's income is set by the function $Y = 3825 \cdot x_1^{3/9} \cdot x_2^{5/9}$, where x_1 — number of sellers, x_2 — number of suppliers. Salary seller 425, supplier — 2125. Find the optimal composition of the company, maximizing profits.

Answer:

304: $\left[x_1 = 81,\ x_2 = 27,\ W = 11475\right]$

/en/Economic and mathematical methods/Street vendor, Internal name: **ZmekoniiZ**,

Name:

Var.:**305.** Group: Day/Mo/Year:

A street vendor buys goods at a price of 12 per piece. Sales of y is associated with assign them a price of v by the formula $y = 4800 - 150 \cdot v$. What is the optimal amount of goods should be purchased by the seller and what should be the optimal price of selling the goods?

Answer:

305: $\left[y = 1500,\ v = 22\right]$

/en/Economic and mathematical methods/Price and costs, Internal name: **ZmekoniiiZ**,

Name:

Var.:**306.** Group: Day/Mo/Year:

The price of v of the company's products is associated with the sales volume y dependence $v(y) = 75 - 4 \cdot y$, the cost of production $I(y) = 1 \cdot y^3 + (-19) \cdot y^2 + (93) \cdot y + (0)$. Find the optimal volume of sales, the price of goods, income and costs at maximum profit.

Answer:

306: $\left[y = 3,\ v = 63,\ I = 135,\ W = 54\right]$

/en/Economic and mathematical methods/Cross-sectoral balance (simple), Internal name: **ZleonteviZ**,

Name:

Var.:**307.** Group: Day/Mo/Year:

$\left(\quad\right)$ $\left(\quad\right)$

On the island of Chunga-Chang in the production of 1 ton of coconuts natives eat 700 kg. coconuts and 200 kg. bananas. In the production of 1 ton. bananas they eat 500 kg. coconuts and 400 kg. bananas.
You need to create a matrix of direct costs and find the matrix of total material costs:

$\left(\quad\right)$ $\left(\quad\right)$

Find out what the harvest of coconuts ( ) and bananas.( ) need to plan for export from Chung-Chang 90 t. coconuts and 40 t. bananas.

307:[$\begin{pmatrix} 0.7 & 0.5 \\ 0.2 & 0.4 \end{pmatrix}$ — direct cost matrix, $\begin{pmatrix} 7.5 & 6.25 \\ 2.5 & 3.75 \end{pmatrix}$ — full cost matrix, 925 T. coconuts and 375 T. bananas.]

/en/Economic and mathematical methods/Interindustry balance, Internal name: **ZobmenZ**,

Name:

Var.:**308.** Group: Day/Mo/Year:

The matrix of direct costs A and the vector of the final product Y are given. To find a vector of the gross domestic product of X. Create a scheme of inter-sectoral balance.

$Y = \begin{pmatrix} 100 \\ 100 \\ 300 \end{pmatrix}$, $A = \begin{pmatrix} 0.2 & 0.1 & 0.3 \\ 0.1 & 0.1 & 0.1 \\ 0.2 & 0.1 & 0.1 \end{pmatrix}$

Answer:

308:[$X = \begin{pmatrix} 307.692 \\ 192.308 \\ 423.077 \end{pmatrix}$,
$Z = \begin{pmatrix} 61.5385 & 19.2308 & 126.923 \\ 30.7692 & 19.2308 & 42.3077 \\ 61.5385 & 19.2308 & 42.3077 \end{pmatrix}$]

/en/Economic and mathematical methods/Budget set, Internal name: **ZbudgetZ**,

Name:

Var.:**309.** Group: Day/Mo/Year:

Nothing

Answer:

309:[$(12, 9)$]

/en/Economic and mathematical methods/Price supply and demand, Internal name: **ZcsprZ**,

Name:

Var.:**310.** Group: Day/Mo/Year:

Given the dependence of demand on price: $D(p) = 210 - 5 \cdot p$ and the dependence of supply on price: $S(p) = -98 + 9 \cdot p$. Find an equilibrium price ( ) and revenue at an equilibrium price ( ). Is the equilibrium state stable? ( ). Find the price at which the revenue from the sale of goods is maximum ( ) and find this maximum revenue ( ).

310:[Equilibrium price:22
Revenues at the Equilibrium price: 2200
is not stable..
Price at maximum revenue:22
Maximum revenue:2200]

/en/Economic and mathematical methods/Selling stuff, Internal name: **ZshtuchkiZ**,

Name:

Var.:**311.** Group: Day/Mo/Year:

Someone decided to buy "things" in bulk at 90 and resell to students. He did two surveys to study demand. In the first 13 students from 18 has agreed to buy the thing for 130. At the second 7 from 18 agreed to buy for 210. The city is home to 3000 students. At what price is it best to resell things to students? (answer:). How many "things" will they buy? (answer:). How much can you earn? (answer:).

311:[Demand function: $y = -12.5x + 3792$, price: 196.7, quantity 1333, revenue: 142231]

/en/Economic and mathematical methods/Sly selling stuff, Internal name: **ZshtuchkiiZ**,

Name:

Var.:**312.** Group: Day/Mo/Year:

Someone decided to buy "things" in bulk at 50 and resell to students in a cunning way: in the morning at the entrance at one price and in the evening at the exit at another, at a discount. He did two surveys to study demand: In the first survey 9 students from 14 agreed to buy a "thing" for 100, On the second survey 6 of 14 agreed to buy for 150. In University come 9000 students. Morning at what price (answer:) and at what evening (answer:) is best Someone to resell stuff to students? How many "things" will they buy? (answer:). How much can Someone make from this? (answer:).

312:[Demand function: $y = -38.58x + 9644$, the price in the morning: 183.3, price in the evening: 116.7, the quantity: 5142, income: 514267]

24 (not checked) Test tasks.

/en/(not checked) Test tasks/Convergence of series, Internal name: **ZintshZ**,

Name:

Var.:**313.** Group: Day/Mo/Year:

Find the interval of convergence of the series:

$$\sum_{n=1}^{n=\infty} \frac{(4 \cdot x + 5)^n \cdot (8 \cdot n^2 - 4)}{(2)^n \cdot (7 \cdot n^{3.8} + 8 \cdot n)}$$

313: $\left[\left[\frac{-7}{4}; \frac{-3}{4}\right]\right]$

25 ANSWERS.

/en/ANSWERS/All the Answers, Internal name: ,

Name:

Var.:**314.** Group: Day/Mo/Year:

314:

/en/ANSWERS/RESPONSE TO REQUEST, Internal name: ,

Name:

Var.:**315.** Group: Day/Mo/Year:

315:

26 Sample.

/en/Sample/Sample all tasks, Internal name: ,

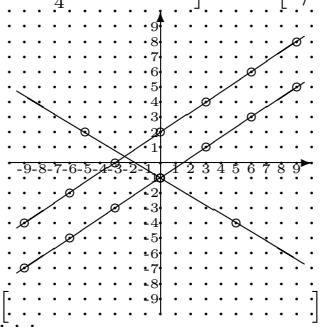
Name:

Var.:**316.** Group: Day/Mo/Year:

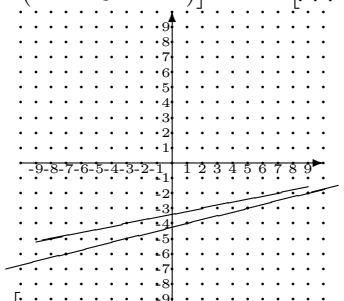
316:

18/12/2018 13:06:23

1: $[x = -3]$ **2**: $[x = 1]$ **3**: $[10]$ **4**: $[-3]$ **5**: $[54]$ **6**: $[34,\ 10]$ **7**: $[45]$ **8**: $[14]$ **9**: $[35]$ **10**: $[4,\ 5.5]$ **11**: $[-1]$ **12**: $[10]$ **13**: $[(3, -7),\ (15, -43)]$ **14**: $[x_1 = 14;\ x_2 = -46]$ **15**: $[x_1 = 9,\ x_2 = 5]$ **16**: $[(0, 6),\ (8, 70)]$ **17**: $[21.1054]$ **18**: $[34/25]$ **19**: $[5.75\%]$ **20**: $[11]$ **21**: $[73]$ **22**: $[15\%]$ **23**: $[1400\text{kg}]$ **24**: $[x = 3]$ **25**: $[x = 4]$ **26**: $[(-\infty; 3) \cup [11; \infty)]$ **27**: $[3]$ **28**: $[(13; -12; 5)]$ **29**: $[(-13; 14; -10)]$ **30**: $[(-22; 7; 9)]$ **31**: $[(-3, -3, 0)]$ **32**: $[(-3, 0, -3)]$ **33**: $[(-1, 1, -4)]$ **34**: $[(1, -1, 3)]$ **35**: $[(3, 4)]$ **36**: $[(194, 40)]$ **37**: $[(\frac{-125}{7}; \frac{-5}{7}) \approx (-17.857; -0.714)]$ **38**: $[(267, -75)]$ **39**: $[(-3, -3, 1)]$ **40**: $[(3, 3, -1)]$ **41**: $[(-2, -4, -3)]$ **42**: $[21 \cdot x + 28 \cdot y + 336 = 0,\ d = 10,\ y = \frac{-3}{4} \cdot x - 12]$ **43**: $[a/b = 4,\ (-12\ \ -3\ \ 12\ \ )]$ **44**: $[$

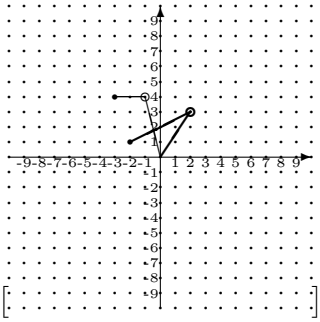


$]$

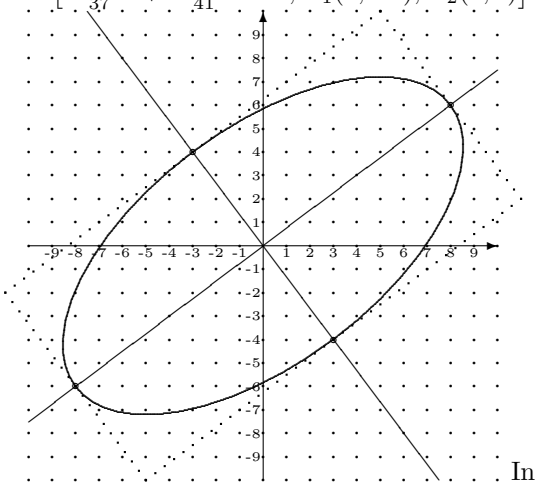


45: $[$, $y = \frac{1}{4} \cdot x + \frac{-17}{4},\ (17, 0)]$ **46**: $[(7, 16),\ (-7, 14),\ (2, 8)]$ **47**: $[(-1, -1)]$ **48**: $[(13, 4),\ (6, 5),\ (7, 12)$ or $(20, 3),\ (21, 10)]$ **49**: $[7]$ **50**: $[2]$ **51**: $[3]$ **52**: $[(25; -5)]$ **53**: $[(28, 10, -26),\ (-36, -8, 22)]$ **54**: $[(2, 2, 1),\ (0, -6, -5)]$ **55**: $[(14, 20)]$ **56**: $[(-12, -34)]$ **57**: $[(-16, 7, 1)]$ **58**: [For ABCD: $(-9, -4)$, For ABDC: $(-3, 6)$] **59**: [For ABCD: $(8, -4, -12)$, For ABDC: $(-2, -2, -6)$] **60**: $[(88; 3),\ (43; 50)$ and $(-6; -87),\ (-51; -40)]$ **61**: $[(124, 84)]$ **62**: $[(31, -22, 34)]$ **63**: $[(86, -82)]$ **64**: $[6]$ **65**: $[-34]$ **66**: $[\pm(6, -4, -6)]$ **67**: $[\lambda \cdot (1, -1, -7)]$ **68**: $[\lambda \cdot (1, 7, 2)]$ **69**: $[-3]$ **70**: $[(2, 2)]$ **71**: $[25]$ **72**: $[x = 4,\ y = 6]$ **73**: $[x = -1,\ y = -2,\ z = 3]$ **74**: $[x = 3,\ y = 1,\ z = -2]$ **75**: $[x_1 = 4,\ x_2 = 3,\ x_3 = 4]$ **76**: $[x_1 = 1,\ x_2 = 1,\ x_3 = -2,\ x_4 = 2]$ **77**: $[(1x_3, 2x_3, x_3)]$ **78**: [Formula to verify the solution: $(1 - 3x_3, -2x_3, x_3)$] **79**: [Formula to verify the solution: $(1 - 3x_4, -2x_4, -1x_4, x_4)$] **80**: $[(1, -3, -3, 1) \cdot \lambda]$ **81**: $[(2x_3 - 2x_4,\ 1x_3 - 1x_4,\ x_3, x_4)]$ **82**: $[x = -3;\ y = 9]$ **83**: $[x = 7;\ y = 5]$ **84**: $[x = 8;\ y = 5;\ z = -3]$ **85**: $[x = 1;\ y = -1;\ z = 1]$ **86**: $[x_1 = -3;\ x_2 = -4;\ x_3 = -3;\ x_4 = 2;\ x_5 = -5]$ **87**: $[x_1 = -7;\ x_2 = -8;\ x_3 = -9;\ x_4 = -1;\ x_5 = 8]$ **88**: $[x = \frac{-6}{5},\ y = \frac{1}{2}.]$ **89**: $[7]$ **90**: $[4 + 2 \cdot i]$ **91**: $[-1 - 7 \cdot i;\ \ 1 + 7 \cdot i]$ **92**: $[-1 \pm 3 \cdot i]$ **93**: $[-3 + 1 \cdot i,\ -1 - 2 \cdot i;]$ **94**: $[-1 - 1 \cdot i,\ \ -3 - 2 \cdot i;]$ **95**: $[2 - 3 \cdot i,$

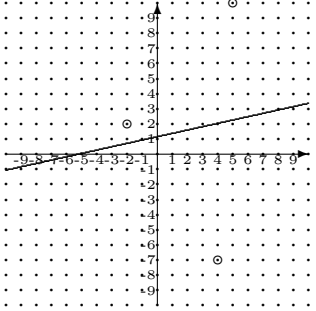
$1-2\cdot i;]$ **96**:$\left[\frac{4}{3};k=2,\ -4;k=1\right]$ **97**:$\left[-3\cdot x^2-8\cdot x-3\right]$
98:$\left[9\ \cdot\ x^2\ -\ 8\right]$ **99**:$\left[-2\cdot s_1s_2^2+2\cdot s_1^2s_3-5\cdot s_2s_3\right]$
100:$\left[12\pm 6\cdot i,\ -3\pm 6\cdot i,\ x^2-24\cdot x+180,\ x^2+6\cdot x+45\right]$
101:$\left[\begin{pmatrix} 12 & -8\\ 14 & -9\end{pmatrix}\right]$ **102**:$\left[\begin{pmatrix} -6 & 0 & -3\\ 6 & -4 & 9\\ -11 & 5 & -13\end{pmatrix}\right]$
103:$\left[A_{32}=-10,\quad A_{11}=8\right]$ **104**:$\left[-1\right]$ **105**:$\left[5\right]$
106:$\left[-4\right]$ **107**:$\left[\begin{pmatrix} 31 & 13\\ 19 & 8\end{pmatrix};\right]$ **108**:$\left[\begin{pmatrix} 1 & -1 & -2\\ 1 & 0 & -1\\ 0 & 0 & 1\end{pmatrix};\right]$
109:$\left[\begin{pmatrix} 1 & 0 & 0 & 0\\ 0 & 1 & 1 & 0\\ 1 & -1 & 1 & -1\\ -1 & 1 & 0 & 1\end{pmatrix}\right]$ **110**:$\left[\begin{pmatrix} 1 & 1 & 0 & 0 & 0\\ -1 & 1 & 1 & 1 & 1\\ 0 & 0 & 1 & 0 & 0\\ -1 & 0 & 0 & 1 & 0\\ -1 & 0 & 1 & 1 & 1\end{pmatrix}\right]$
111:$\left[A^{-1}=\begin{pmatrix} 2 & 1\\ 1 & 1\end{pmatrix},\quad X=\begin{pmatrix} 2 & 1\\ 0 & 3\end{pmatrix},\quad Y=\begin{pmatrix} 2 & 1\\ 3 & 2\end{pmatrix}\right]$
112:$\left[A^{-1}=\begin{pmatrix} 0 & -1\\ -1 & 1\end{pmatrix},\qquad X=\begin{pmatrix} 2 & 1\\ 2 & 1\end{pmatrix}\right]$
113:$\left[A^{-1}=\begin{pmatrix} -1 & 0 & 0\\ 0 & 0 & -1\\ 1 & 1 & 1\end{pmatrix},\quad X=\begin{pmatrix} 0 & 1 & 1\\ 0 & 0 & 1\\ 1 & 0 & 0\end{pmatrix}\right]$
114:$\left[A^{-1}=\begin{pmatrix} -1 & 0 & 0 & 0\\ 1 & 0 & -1 & 1\\ 0 & 1 & 1 & 0\\ 1 & 0 & 0 & 1\end{pmatrix},\ X=\begin{pmatrix} 1 & 1 & 0 & 0\\ 1 & 1 & 0 & 1\\ 0 & 1 & 0 & 0\\ 1 & 1 & 1 & 1\end{pmatrix}\right]$
115:$\left[A^{-1}=\begin{pmatrix} 1 & 0 & 0 & 0 & 0\\ -1 & 2 & 1 & -1 & 1\\ -1 & 0 & 1 & 0 & 0\\ 1 & 0 & -1 & 1 & 0\\ 0 & 1 & 0 & 0 & 1\end{pmatrix},\right.$
$\left.X=\begin{pmatrix} 1 & 1 & 1 & 1 & 1\\ 0 & 0 & 1 & 0 & 1\\ 0 & 0 & 1 & 0 & 0\\ 1 & 1 & 0 & 1 & 0\\ 0 & 1 & 0 & 0 & 0\end{pmatrix}\right]$
116:$\left[A^{-1}=\begin{pmatrix} -1 & 0 & 0 & 0 & -1 & 1\\ 0 & 1 & 0 & 0 & 0 & 0\\ 0 & -1 & 0 & -1 & 0 & 0\\ 1 & 1 & 1 & 1 & 0 & 0\\ 0 & 0 & 0 & 0 & 1 & 0\\ 0 & 0 & 0 & 0 & -1 & 1\end{pmatrix},\right.$
$\left.X=\begin{pmatrix} 1 & 1 & 1 & 0 & 1 & 0\\ 0 & 1 & 1 & 1 & 0 & 0\\ 1 & 0 & 1 & 0 & 0 & 0\\ 0 & 1 & 1 & 0 & 0 & 1\\ 1 & 0 & 1 & 0 & 0 & 1\\ 0 & 1 & 0 & 1 & 1 & 1\end{pmatrix}\right]$ **117**:$\left[(2x_3-2x_4,\right.$
$\left.-2x_3+1x_4,\ x_3,\ x_4)\right]$ **118**:$\left[(-2x_3+2x_4,\ 2x_3+2x_4,\ x_3,\ x_4)\right]$
119:$\left[\frac{1}{41}\begin{pmatrix} -9 & 40\\ 40 & 9\end{pmatrix}\right]$ **120**:$\left[\begin{pmatrix} 1 & 0 & -2 & 0 & 1\\ 0 & 1 & 2 & 0 & 1\\ 0 & 0 & 0 & 1 & -1\\ 0 & 0 & 0 & 0 & 0\end{pmatrix}\right]$
121:$\left[\begin{pmatrix} 1 & -2\\ 4 & 7\end{pmatrix}\right]$ **122**:$\left[\begin{pmatrix} -3 & 2\\ -12 & 7\end{pmatrix}\right]$
123:$\left[\begin{pmatrix} -1 & -4 & -4\\ 2 & 5 & 2\\ 0 & 0 & 3\end{pmatrix}\right]$ **124**:$\left[\begin{pmatrix} 4 & 1 & 2\\ 0 & 3 & 0\\ -1 & -1 & 1\end{pmatrix}\right]$
125:$\left[1\cdot x^2+4\cdot y^2,\quad \begin{pmatrix} 3 & -2\\ 2 & 3\end{pmatrix}/\sqrt{13}\right]$ **126**:$\left[\begin{pmatrix} 18\\ 9\end{pmatrix},\right.$
$\left.\begin{pmatrix} 1\\ 3\end{pmatrix}\right]$ **127**:$\left[A=\begin{pmatrix} 4 & -5\\ -3 & 3\end{pmatrix},\quad B=\begin{pmatrix} -1 & \frac{-5}{3}\\ -1 & \frac{-4}{3}\end{pmatrix}\right]$



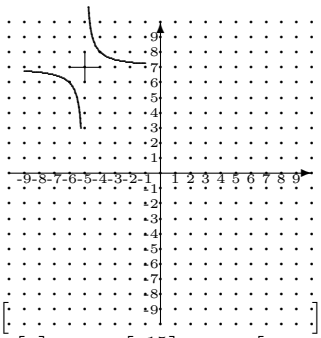
128:$\left[\right]$ **129**:$\left[\begin{pmatrix} 3 & 4\\ -4 & -3\end{pmatrix}\right]$
130:$\left[\begin{pmatrix} 1 & 1\\ 2 & 1\end{pmatrix}\right]$ **131**:$\left[T_{std\leftarrow a}=\begin{pmatrix} -1 & -2\\ -2 & 1\end{pmatrix},\right.$
$T_{a\leftarrow std}=\begin{pmatrix} \frac{-1}{5} & \frac{-2}{5}\\ \frac{-2}{5} & \frac{1}{5}\end{pmatrix},$ $T_{std\leftarrow b}=\begin{pmatrix} -8 & -1\\ -6 & 8\end{pmatrix},$
$T_{b\leftarrow std}=\begin{pmatrix} \frac{-4}{35} & \frac{-1}{70}\\ \frac{-3}{35} & \frac{4}{35}\end{pmatrix}$ $T_{b\leftarrow a}=\begin{pmatrix} \frac{1}{7} & \frac{3}{14}\\ \frac{-1}{7} & \frac{2}{7}\end{pmatrix},$
$T_{a\leftarrow b}=\begin{pmatrix} 4 & -3\\ 2 & 2\end{pmatrix},$ $\vec{c}=\begin{pmatrix} 4\\ 1\end{pmatrix}_{std},$ $\vec{c}=\begin{pmatrix} \frac{-6}{5}\\ \frac{-7}{5}\end{pmatrix}_a,$
$\left.\vec{c}=\begin{pmatrix} \frac{-33}{70}\\ \frac{-8}{35}\end{pmatrix}_b\right]$ **132**:$\left[1.\begin{pmatrix} 0 & 0 & -1\\ 0 & 1 & 0\\ 1 & 0 & 0\end{pmatrix}\right.$ $2.\begin{pmatrix} 0 & 1 & 0\\ -1 & 0 & 0\\ 0 & 0 & 1\end{pmatrix}$
$\left.3.\begin{pmatrix} 1 & 0 & 0\\ 0 & 0 & -1\\ 0 & 1 & 0\end{pmatrix}\right]$ **133**:$\left[\frac{1}{81}\cdot\begin{pmatrix} 1 & -68 & -44\\ 76 & 16 & -23\\ 28 & -41 & 64\end{pmatrix}\right]$
134:$\left[2\begin{pmatrix} 1\\ -3\end{pmatrix},\qquad -4\begin{pmatrix} -1\\ 4\end{pmatrix}\right]$ **135**:$\left[4\right]$
136:$\left[A=(-4,-2,1,0),\qquad B=(1,1,6,1),\qquad C=\right.$
$\left.(-4,-2,-20,126);\ B:=B-2\cdot A;\ C:=C+A-2\cdot B\right]$
137:$\left[(4,0,1),\quad \cos\alpha=\frac{-4}{13}=-0.308\right]$ **138**:
139:$\left[B=\begin{pmatrix} 225 & 135\\ 135 & 225\end{pmatrix},\ C=\frac{1}{5}\cdot\begin{pmatrix} -4 & -3\\ 3 & -4\end{pmatrix}\right]$
140:$\left[B=\begin{pmatrix} 65 & 45\\ 45 & 185\end{pmatrix},\ C=\frac{1}{5}\cdot\begin{pmatrix} 3 & 4\\ -4 & 3\end{pmatrix}\right]$
141:$\left[\frac{(x-5)^2}{37}+\frac{(y+2)^2}{41}=1,\ F_1(5,-4),\ F_2(5,0)\right]$ **142**:$\left[\right.$



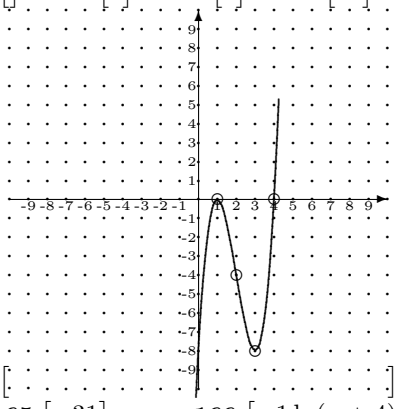
$\left.\right]$ In replacement there is -3 and 4. Equation: $4x^2+1y^2=100$ or $(x/5)^2+(y/10)^2=1$] **143**:$\left[6\right]$ **144**:$\left[\vec{c}=-8\cdot\vec{a}-6\cdot\vec{b}\right]$



145:$\left[\lambda\cdot(-1,2,3)\right]$ **146**:$\left[\right.$ $\left.\right]$ $y=$



$\frac{19}{86}\cdot x+\frac{99}{86}\approx 0.22\cdot x+1.15$] **147**:[ ]
148:$\left[\frac{10}{11}\approx 0.909\right]$ **149**:[0] **150**:[7] **151**:$[e^{15}]$ **152**:[$y = 5x - 7$, $x = -2, f(-2 + 0) = +\infty$, $x = -1, f(-1 - 0) = +\infty, f(-1 + 0) = -\infty$] **153**:$[(2, -7)]$
154:$[(2, -5)]$ **155**:$[(3, 1), (5, 21)]$ **156**:[Max= 1, Min= 7, inflection point= 4] **157**:$[(-4, 2, -20),\ (-3, 9, 30)]$
158:[] **159**:[6] **160**:[1] **161**:[34] **162**:[] **163**:[−6]



164:[ ]
165:[−31] **166**:$[-1\ln(x+4)-3\ln(x+1)]$
167:$[-2x^2+4x+4\ln(x+2)+2\ln(x+1)]$
168:$[4\ln(x+1)+2/(x+1)+4\ln(x-1)]$
169:$[-1\ln(x^2-4\cdot x+5)+3arctg(x-2)]$
170:$[3\ln(x^2+6\cdot x+18)+3arctg((x+3)/3)]$
171:$[x^2+2\cdot x-2\ln(x^2-4\cdot x+5)+3arctg(x-2)]$
172:$[(-2x+\frac{-4}{3})\cos(3x-2)+\frac{2}{3}\sin(3x-2)]$
173:[7] **174**:[9] **175**:$[891\cdot\pi]$ **176**:$[136\cdot\pi]$
177:[90] **178**:[26] **179**:[26] **180**:[6] **181**:[20]
182:[0.0807692] **183**:$[\int_0^2 dx\int_{-8\cdot x}^{\frac{-12}{4}\cdot x} f(x,y)dy + \int_2^4 dx\int_{-x^2+8\cdot x-28}^{\frac{-12}{4}\cdot x} f(x,y)dy]$ **184**:$[2\cdot x^2+2\cdot x-2]$
185:[1.22474] **186**:

x	3	2.65	2.575
y	7	1.06	0.049

187:[−3.504]
188:$[(2, 1.468)]$ **189**:[6304, 2209] **190**:$[DE]$ **191**:[95]
192:$[12.8125 = 1100.1101]$ **193**:$[14.3125 = 1110.0101]$
194:$[3.5 = 0/10000/1100000000]$ **195**:$[4680 = 0/10001/1010000000]$ **196**:[40C0, 0.8125]
197:$[-5.5 = 1/10000001/01100000000000000000000]$
198:[0.881] **199**:[0.985, 1, 0.918, 0.965, 1.95] **200**:[bcbdaddddbddbdcddaa] **201**:[Table: a-010 b-011 c-00 d-1, compression Result: 0100110011100010100011100111010100100, after compression 37 bits.] **202**:[Compressed file: 0 0 1 5 1 2 2 1 6 0. Dictionary: (0-a) (1-b) (2-c) (3-d) (4-aa) (5-ab) (6-ba) (7-abb) (8-bc) (9-cc) (10-cb) (11-bb) (12-baa).] **203**:[Compressed file: 0 0 1 4 3 7 5 7 8 10 0 2 9 0 or 00 00 001 100 011 111 0101 0111 1000 1010 0000 0010 1001 0000. $K = 58/48 \approx 1.21$. Dictionary: (0-00-a) (1-01-b) (2-10-c) (3-11-aa) (4-100-ab) (5-101-ba) (6-110-aba) (7-111-aaa) (8-1000-aaab) (9-1001-baa) (10-1010-aaaa) (11-1011-aaaba) (12-1100-aaaaa) (13-1101-ac) (14-1110-cb) (15-1111-baaa).] **204**:[Source file: abcbabaacbbb. Dictionary: (0-a) (1-b) (2-c) (3-d) (4-ab) (5-bc) (6-cb) (7-ba) (8-aba) (9-aa) (10-ac) (11-cbb) (12-bb).] **205**:[Source file: bbababcbbbbbcbc. Dictionary: (0-a) (1-b) (2-c) (3-d) (4-bb) (5-ba) (6-ab) (7-bab) (8-bc) (9-cb) (10-bbb) (11-bbbc) (12-cbc).] **206**:[Table: a-1 b-011 c-010 d-00, average code length: 1.76, relative redundancy: 0.0068, I: 1.75013, encoding result: 110101011.] **207**:[2E3]
208:[F4] **209**:[231, DF] **210**:[

	1	2	3	4	5
a	4	2	3	3	4
b	2	5	3	3	3

In: 1, Out: 2, 4.] **211**:[

	1	2	3
a	2	3	3
b	3	1	3

In: 2, Out: 1.] **212**:[

	1	2	3	4
a	1	4	1	3
b	1	1	1	1

In: 2, Out: 2, 3, 4.]
213:[

	1	2	3	4	5
a	4	2	3	3	5
b	2	5	3	3	4

In: 1, Out: 2, 4, 5.]
214:[

	1	2	3	4	5	6
a	2	5	1	4	5	3
b	2	5	1	5	5	4

In: 6, Out: 2, 4, 6.]
215:[

	1	2	3	4	5	6	7
a	2	4	3	6	5	5	1
b	1	2	5	4	5	5	3

In: 7, Out: 1, 3, 6.] **216**:[

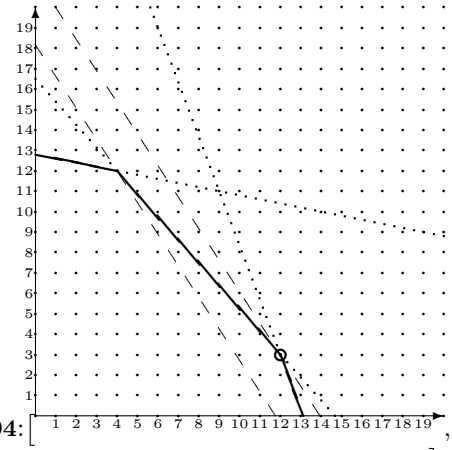
	(13)	(25)	(4)	(6)
a	(13)	(13)	(25)	(4)
b	(13)	(13)	(25)	(25)

In: (6), Out: (25), (4), (6).] **217**:[

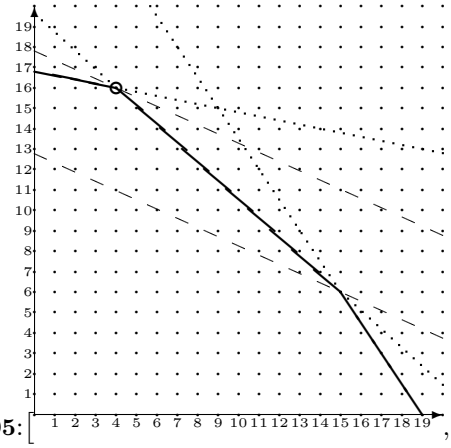
	(13)	(25)	(47)	(68)	(9)
a	(25)	(9)	(47)	(47)	(68)
b	(47)	(13)	(47)	(68)	(25)

In: (13), Out: (25), (68), (9).] **218**:[FIRST: ac, b, c, a, d, abc, Tree: (S (A a (A a (A cc))) (B (S b (A cc))a)).] **219**:[(1 0 0 1, 0 1 1 0, 1 0 1 0)]
220:[(0 0 1 1 1, 1 0 0 0 0, 0 1 0 0 1)] **221**:[(1 1 1 0 1 0 **0** 0, 1 0 1 0 0 1 **1** 0, 1 0 **0** 1 0 1 1 1)] **222**:[(0 1 0 0), (1 1 0 0), (0 1 1 1)] **223**:$[(0x_3+1x_4,\ 0x_3+1x_4,\ x_3, x_4)]$
224:[11/665] **225**:[251/13353463] **226**:$[x = 1270]$
227:$[x = 22]$ **228**:$[x = 41]$ **229**:[b=61; Key=2135 4453 9455 8910 7881 6067 ; Crypt=14469; Mess=011010;] **230**:[b=1203; Key=902 7819 4059 4133 8266 7735 ; Crypt=13227; Mess=110100;] **231**:$[(\mathbf{5};\mathbf{9}) \to (75),\ (4;8) \to (\mathbf{74})]$ **232**:$[(\mathbf{49};\mathbf{47}) \to (1109),\ (25;55) \to (\mathbf{2887})]$
233:[436] **234**:[181] **235**:[42] **236**:[Message: 23, public key: 23 Crypt: (26, 19).] **237**:[(14, 24).]
238:$[y = 5+9\cdot(x-3)-2\cdot(x-3)^2+5\cdot(x-3)^3+23\cdot(x-3)^4]$
239:$[y = -6x+5]$ **240**:$[-3x^3y^5 - 2x^4 = c,\ x^{-2}]$
241:$[y = -9(x-7)ln(x-7)+C(x-7)+69]$
242:$[C_1\cdot e^{-1x}+C_3\cdot e^{-3x}]$
243:$[C_1\cdot e^{-1x}+C_2\cdot x\cdot e^{-1x}+C_3\cdot e^{-4x}]$ **244**:$[C_1\cdot e^{3x}+C_2\cdot x\cdot e^{3x}+(4\cdot x^2-2)]$ **245**:$[C_1\cdot e^{-2x}+C_2\cdot e^{-1x}+(3\cdot e^{1x}-3\cdot\cos(1x)+1\cdot\sin(1x))]$
246:$[C_1\cdot e^{-2x}+C_2\cdot e^{3x}+(4\cdot x+5-4\cdot x\cdot e^{3x})]$ **247**:$[C_1\cdot e^{-2x}+C_2+(-4\cdot x^3-5\cdot x^2-2\cdot x)]$ **248**:$[y=\sqrt{8\cdot x^2+41\cdot x^{18}}]$
249:$[y+\frac{C_1}{y^9}=10x+C_2]$ **250**:$[y^4=C\cdot e^{16\cdot x}+\frac{-4}{17}\cdot e^{-1\cdot x}]$
251:[4] **252**:$[y=\frac{24}{C\cdot x^{-28}-7\cdot x^{-4}}+4\cdot x^4]$ **253**:[4]
254:$[\begin{cases} x=(C+\frac{1}{2}\cdot\ln|p+\frac{-1}{2}|)\cdot p^{-2}, \\ y=(2+-2\cdot p)\cdot(C+\frac{1}{2}\cdot\ln|p+\frac{-1}{2}|)\cdot p^{-1}+1\cdot\ln|p|. \end{cases}]$
255:[3] **256**:$[1{:}\frac{29}{90}=0.322222,\ 2:\frac{15}{29}=0.517241]$
257:[0.991296] **258**:$[\frac{84}{3003}=\frac{4}{143}=0.028]$
259:[36] **260**:$[0.65; 0.15]$ **261**:$[M=6,\ D=3]$
262:[0.842] **263**:[330] **264**:$[0.433932, 0.522485]$
265:$[(8.75704; 9.33896)]$ **266**:$[2.97; 0.0876784;$

$(2.87405; 3.06595)]$ **267**:$[7]$ **268**:$[\frac{2}{35} \approx 0.057]$ **269**:$[\frac{14}{3} \approx 4.667]$ **270**:$[\sum = 38$, ad, be, cf$]$ **271**:$[\sum = 51$, ae, bg, ch, df$]$ **272**:$[\sum = 58$, ah, bg, cf, dj, ei$]$ **273**:$[\sum = 113$, ah, bj, ci, dk, el, fg$]$ **274**:$[\sum = 162$, an, bh, ck, dj, el, fi, gm$]$ **275**:$[]$ **276**:$[1317.92]$ **277**:$[12107.5]$ **278**:$[3608.45]$ **279**:$[772.177]$ **280**:$[15.6105]$ **281**:$[1.49209]$ **282**:$[9.93761]$ **283**:$[2.98836]$ **284**:$[6.13636]$ **285**:$[A1 = 1116.35,\ B1 = 1681.94]$ **286**:$[14.3261]$ **287**:$[-3,\ (3,3)]$ **288**:[The strategy of the left of the player: ($\frac{1}{5}$ 0 $\frac{4}{5}$), Strategy the top player: ($\frac{4}{5}$ 0 $\frac{1}{5}$) price games: $\frac{28}{5}$] **289**:$[\frac{-22}{9}, (\frac{4}{9}, \frac{5}{9}), (0, \frac{1}{9}, \frac{8}{9})]$ **290**:$[(8,5,0,7,0,0),\ L(x) = 1]$ **291**:$[x_{ij} = \begin{pmatrix} 0 & 0 & 20 \\ 0 & 30 & 10 \\ 10 & 0 & 20 \end{pmatrix},\ L = 920]$ **292**:$[X = (0,0,-8,5),\ Y = (-2,5),\ L = -133]$ **293**:$[(9,7),$



$123,\ 3 - 2]$ **294**:[, A – 12, B – 3, Profit – 474.]



295:[, $x_i = (4;16),\ L(x) = L(y) = 552,\ y_i = (1;4;0)]$ **296**:$[t_1 = 5;\ t_2 = 0;\ t_3 = 5;\ max = min = 285]$ **297**:$[t_1 = 0;\ t_2 = 5;\ t_3 = 1;\ t_4 = 0;\ max = min = 103]$ **298**:$[x_1 = 0;\ x_2 = 5;\ t_1 = 0;\ t_2 = 2;\ max = 10]$ **299**:$[x_1 = 5;\ x_2 = 5;\ x_3 = 0;\ t_1 = 4;\ t_2 = 2;\ t_3 = 0;\ max = 290]$ **300**:$[x_1 = 5;\ x_2 = 0;\ x_3 = 4;\ x_4 = 0;\ t_1 = 2;\ t_2 = 5;\ t_3 = 0;\ t_4 = 0;\ max = 133]$ **301**:$[x_1 = 0;\ x_2 = 4;\ x_3 = 0;\ x_4 = 2;\ x_5 = 5;\ t_1 = 0;\ t_2 = 2;\ t_3 = 0;\ t_4 = 1;\ t_5 = 5;\ max = 218]$ **302**:$[x_1 = 6;\ x_2 = 0;\ x_3 = 6;\ x_4 = 0;\ x_5 = 0;\ t_1 = 3;\ t_2 = 5;\ t_3 = 0;\ max = 354]$ **303**:$[(4,1,14)]$ **304**:$[x_1 = 81,\ x_2 = 27,\ W = 11475]$ **305**:$[y = 1500,\ v = 22]$ **306**:$[y = 3,\ v = 63,\ I = 135,\ W = 54]$ **307**:[$\begin{pmatrix} 0.7 & 0.5 \\ 0.2 & 0.4 \end{pmatrix}$ — direct cost matrix, $\begin{pmatrix} 7.5 & 6.25 \\ 2.5 & 3.75 \end{pmatrix}$ — full cost matrix, 925 T. coconuts and 375 T. bananas.]

308:$[X = \begin{pmatrix} 307.692 \\ 192.308 \\ 423.077 \end{pmatrix},$
$Z = \begin{pmatrix} 61.5385 & 19.2308 & 126.923 \\ 30.7692 & 19.2308 & 42.3077 \\ 61.5385 & 19.2308 & 42.3077 \end{pmatrix}]$ **309**:$[(12,9)]$

310:[Equilibrium price:22
Revenues at the Equilibrium price: 2200
is not stable..
Price at maximum revenue:22
Maximum revenue:2200] **311**:[Demand function: $y = -12.5x + 3792$, price: 196.7, quantity 1333, revenue: 142231] **312**:[Demand function: $y = -38.58x + 9644$, the price in the morning: 183.3, price in the evening: 116.7, the quantity: 5142, income: 514267] **313**:$[[\frac{-7}{4}; \frac{-3}{4}]]$ **314**: **315**: **316**: