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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 $3 \leq x \leq 15$.

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:

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

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 $-6 \leq x \leq 8$.

Answer: _____

16: [(0, 6), (8, 70)]

/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: [21.1054]

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

Name:

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

Write the answer in the form of an irreducible fraction.

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

18: [34/25]

/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: [5.75%]

/en/School tasks/Percent solution Addition, Internal name: ZpercentAZ ,

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: [11]

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

Name:

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

Nothing

Answer: _____

21: [73]

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

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: [15%]

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

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: [1400kg]

/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: [x = 3]

/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: [x = 4]

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

Name:

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

Solve the inequality:

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

Answer: _____

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

/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: ZplttZ ,

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: ZpltttZ ,

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: $[(-1, 1, -4)]$

/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: $[(1, -1, 3)]$

/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: $[(3, 4)]$

/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: $[(194, 40)]$

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

/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: $[(267, -75)]$

/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: $[(-3, -3, 1)]$

/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: $[(3, 3, -1)]$

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

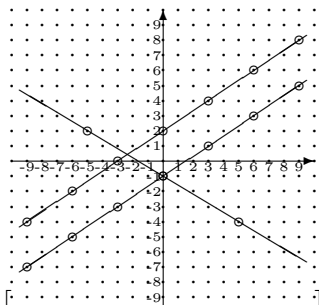
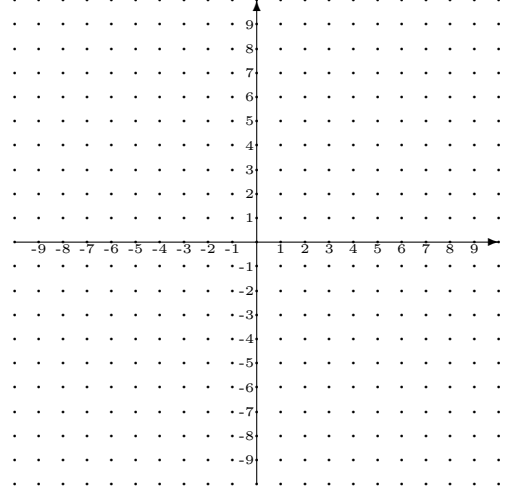
/en/Geometry (simple)/Three straight lines, Internal name: ZtriprZ , ...

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: $[\dots]$

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

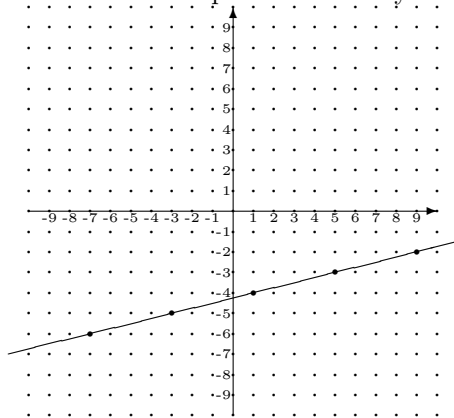
Name:

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

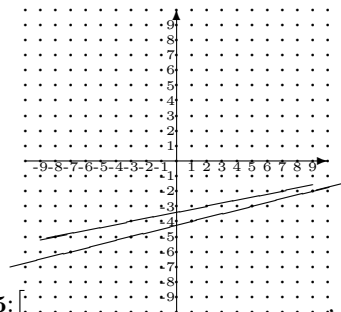
Find the equation of the drawn line.

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: (\quad , \quad).



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

/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: [(7, 16), (-7, 14), (2, 8)]

/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: [(-1, -1)]

/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: [(13, 4), (6, 5), (7, 12) or (20, 3), (21, 10)]

/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 $\vec{a} = (2, -4, 4)$.

Answer: _____

49: [7]

/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: [2]

/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: [3]

/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: [(25; -5)]

4 Geometry (complex).

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

Name:

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: [(28, 10, -26), (-36, -8, 22)]

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

Name:

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: [(2, 2, 1), (0, -6, -5)]

5 Vectors.

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

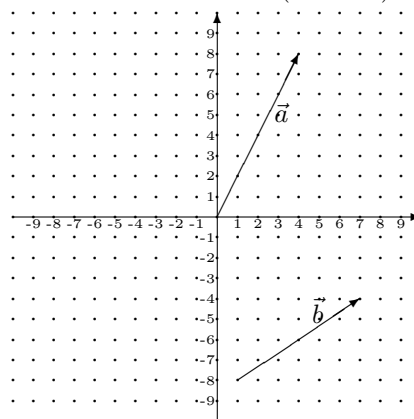
Name:

Name:

Var.:**55**. Group:

Day/Mo/Year:

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



Answer: _____

55: [(14, 20)]

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

Name:

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: [(-12, -34)]

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

Name:

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: [(-16, 7, 1)]

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

Name:

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: [For ABCD: (-9, -4), For ABDC: (-3, 6)]

/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: **ZverkvadrZ** ,

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 of the equation system:

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

Answer:

77: $[(1x_3, 2x_3, x_3)]$

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

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

/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 equation system:

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

Answer:

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

/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: $[(2x_3 - 2x_4, 1x_3 - 1x_4, x_3, x_4)]$

/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: $[x = -3; y = 9]$

/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: $[x = 7; y = 5]$

/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: $[x = 8; y = 5; z = -3]$

/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: $[x = 1; y = -1; z = 1]$

/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: $[x_1 = -3; x_2 = -4; x_3 = -3; x_4 = 2; x_5 = -5]$

/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: $[x_1 = -7; x_2 = -8; x_3 = -9; x_4 = -1; x_5 = 8]$

/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: $x = \left(\frac{\quad}{\quad}\right), y = \left(\frac{\quad}{\quad}\right)$.

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

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: $[7]$

/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: $[4 + 2 \cdot i]$

/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: $[-1 - 7 \cdot i; 1 + 7 \cdot i]$

/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: $[-1 \pm 3 \cdot i]$

/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: $[-3 + 1 \cdot i, -1 - 2 \cdot i;]$

/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: $[-1 - 1 \cdot i, -3 - 2 \cdot i;]$

/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: _____

$$\mathbf{95}: [2 - 3 \cdot i, 1 - 2 \cdot i;]$$

/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: _____

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

/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: _____

$$\mathbf{97}: [-3 \cdot x^2 - 8 \cdot x - 3]$$

/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: _____

$$\mathbf{98}: [9 \cdot x^2 - 8]$$

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

Name:

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

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

Answer: _____

$$\mathbf{99}: [-2 \cdot s_1 s_2^2 + 2 \cdot s_1^2 s_3 - 5 \cdot s_2 s_3]$$

/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: _____

$$\mathbf{100}: [12 \pm 6 \cdot i, -3 \pm 6 \cdot i, x^2 - 24 \cdot x + 180, x^2 + 6 \cdot x + 45]$$

8 Matrix.

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

Name:

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

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

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

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

Name:

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

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

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

/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

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

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

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

Name:

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

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

$$\underline{\underline{104: [-1]}}$$

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

Name:

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

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

$$\underline{\underline{105: [5]}}$$

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

Name:

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

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

$$\underline{\underline{106: [-4]}}$$

/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:

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

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

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:

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

/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:

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

/en/Matrix/Inverse 5x5 matrix, Internal name: **Zo-bratvZ** ,

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

$$A = \begin{pmatrix} 1 & -1 \\ -1 & 2 \end{pmatrix}; A \cdot X = \begin{pmatrix} 2 & -2 \\ -2 & 5 \end{pmatrix};$$

$$Y \cdot A = \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$$

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

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

Name:

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

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

$$A = \begin{pmatrix} -1 & -1 \\ -1 & 0 \end{pmatrix}; A \cdot X = \begin{pmatrix} -4 & -2 \\ -2 & -1 \end{pmatrix}$$

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

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

Name:

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

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

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

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

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

Name:

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

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

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

$$\begin{pmatrix} -1 & 1 & 1 & -1 \\ 0 & 1 & 1 & 0 \\ 0 & 1 & 1 & -1 \\ 0 & 0 & 1 & 1 \end{pmatrix}$$

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

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

Name:

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

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

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

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

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

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

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

Name:

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

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

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

$$\mathbf{116}: [A^{-1} = \begin{pmatrix} -1 & 0 & 0 & 0 & -1 & 1 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & -1 & 0 & 0 \\ 1 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & -1 & 1 \end{pmatrix}, X = \begin{pmatrix} 1 & 1 & 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 1 & 1 \end{pmatrix}]$$

9 Linear algebra.

/en/Linear algebra/Matrix core, Internal name: Zk-eriZ ,

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: _____

$$\mathbf{117}: [(2x_3 - 2x_4, -2x_3 + 1x_4, x_3, x_4)]$$

/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: _____

$$\mathbf{118}: [(-2x_3 + 2x_4, 2x_3 + 2x_4, x_3, x_4)]$$

/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: _____

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

/en/Linear algebra/Basis selection, Internal name: ZsbasisZ ,

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: _____

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

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

Name:

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

Nothing

121: [[(1 -2) / (4 7)]]

/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 · A = (-15 8 / -48 25)

Answer:

122: [(-3 2 / -12 7)]

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

Name:

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

Nothing

123: [(-1 -4 -4 / 2 5 2 / 0 0 3)]

/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 · A = (14 5 10 / 0 9 0 / -5 -5 -1)

Answer:

124: [(4 1 2 / 0 3 0 / -1 -1 1)]

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

Name:

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

The quadratic form (25 · x² - 36 · x · y + 40 · y²)/13 is given. Find the orthogonal change of variables, after which it takes the canonical form.

Answer:

125: [1 · x² + 4 · y², (3 -2 / 2 3) / 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 (-3 3 / -2 1).

Find the image of the vector (-3 / 3). Answer:

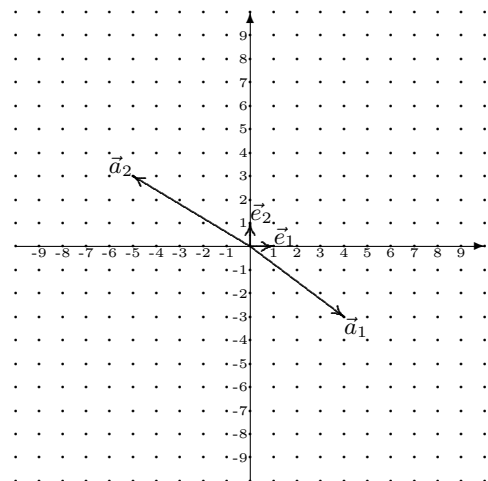
Find the prototype of the vector (6 / 1). Answer:

126: [(18 / 9), (1 / 3)]

/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 a1 in e1 and the vector a2 in e2.

Answer: A = (), B = ()

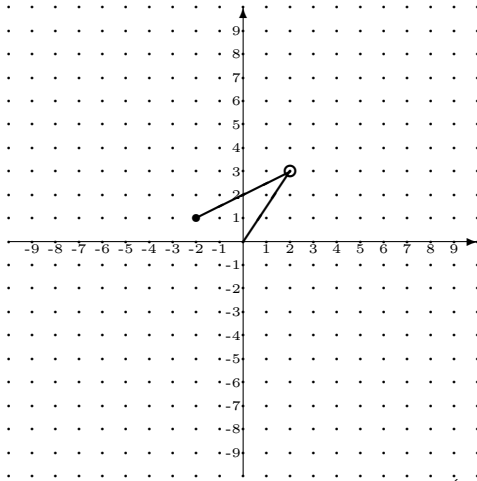
127: [A = (4 -5 / -3 3), B = (-1 -5/3 / -1 -4/3)]

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

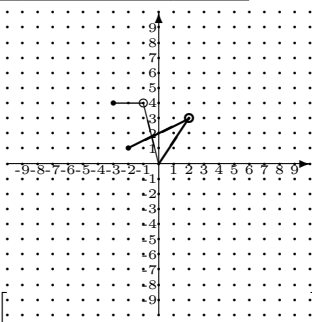
Name:

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.



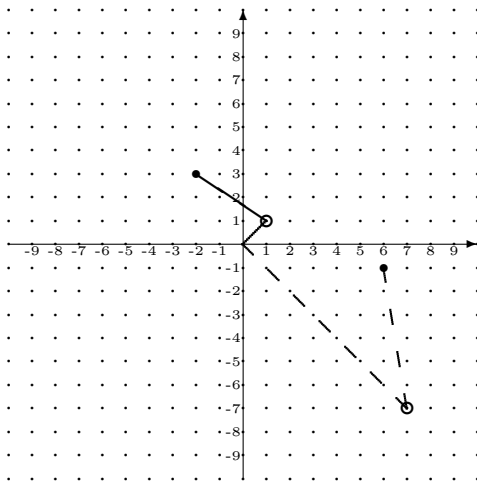
128: [[]]

/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:

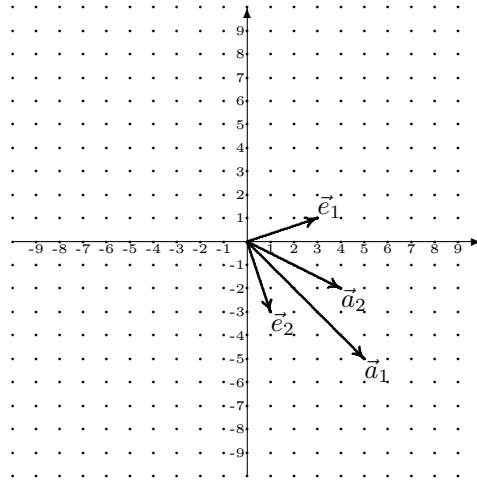
129: $\begin{bmatrix} 3 & 4 \\ -4 & -3 \end{bmatrix}$

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

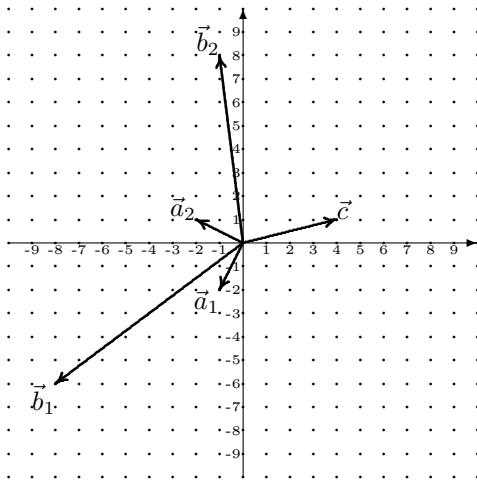
130: $\begin{bmatrix} 1 & 1 \\ 2 & 1 \end{bmatrix}$

/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:

$$\vec{c} = \begin{pmatrix} & \\ & \end{pmatrix}_{std}, \vec{c} = \begin{pmatrix} & \\ & \end{pmatrix}_a, \vec{c} = \begin{pmatrix} & \\ & \end{pmatrix}_b$$

$$\mathbf{131:} [T_{std \leftarrow a} = \begin{pmatrix} -1 & -2 \\ -2 & 1 \end{pmatrix}, T_{a \leftarrow std} = \begin{pmatrix} -\frac{1}{5} & -\frac{2}{5} \\ \frac{2}{5} & \frac{1}{5} \end{pmatrix},$$

$$T_{std \leftarrow b} = \begin{pmatrix} -8 & -1 \\ -6 & 8 \end{pmatrix}, T_{b \leftarrow std} = \begin{pmatrix} -\frac{4}{35} & -\frac{1}{35} \\ \frac{3}{35} & \frac{7}{35} \end{pmatrix}]$$

$$T_{b \leftarrow a} = \begin{pmatrix} \frac{1}{7} & \frac{3}{7} \\ -\frac{1}{7} & \frac{14}{7} \end{pmatrix}, T_{a \leftarrow b} = \begin{pmatrix} 4 & -3 \\ 2 & 2 \end{pmatrix}, \vec{c} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}_{std},$$

$$\vec{c} = \begin{pmatrix} -\frac{6}{5} \\ -\frac{7}{5} \end{pmatrix}_a, \vec{c} = \begin{pmatrix} -\frac{33}{70} \\ -\frac{8}{35} \end{pmatrix}_b]$$

/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:

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

/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:

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

/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:

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

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

/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: ZKVADRgrafZ ,

Name: _____

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

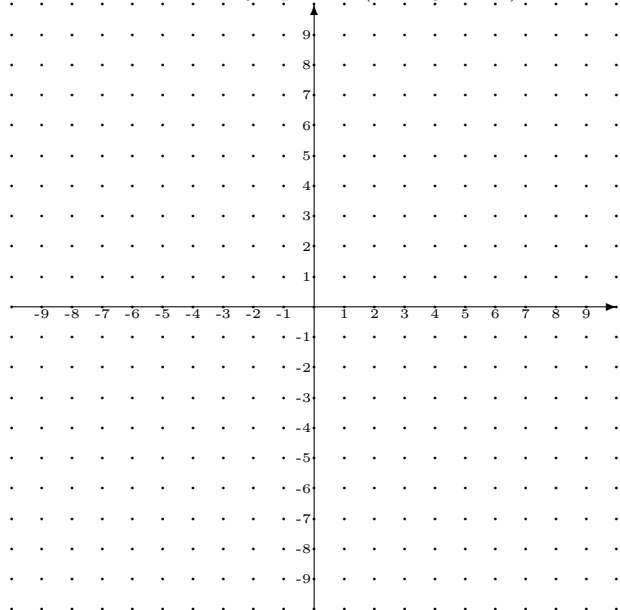
The equation of the line is given: $52x^2 + 73y^2 - 72xy = 2500$. Find the orthogonal change of variables

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

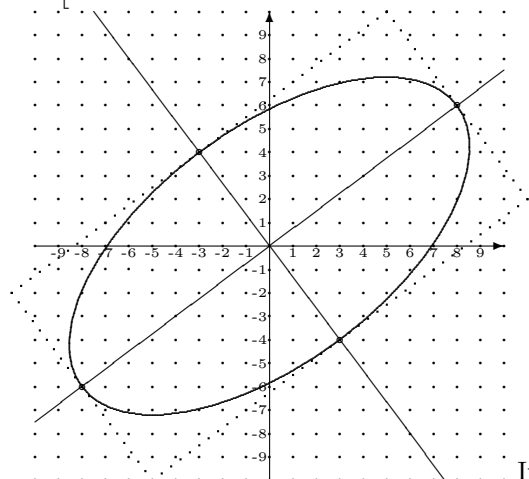
after which the equation becomes the canonical equation of the quadric:

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

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

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

Name: _____

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

Find a basis of the intersection:

$$\left\langle \begin{pmatrix} 3 \\ -4 \\ -5 \end{pmatrix}, \begin{pmatrix} 2 \\ -3 \\ -4 \end{pmatrix}, \begin{pmatrix} 6 \\ -9 \\ -12 \end{pmatrix} \right\rangle \cap \left\langle \begin{pmatrix} -5 \\ 9 \\ 14 \end{pmatrix}, \begin{pmatrix} 7 \\ -11 \\ -18 \end{pmatrix} \right\rangle$$

Answer: _____

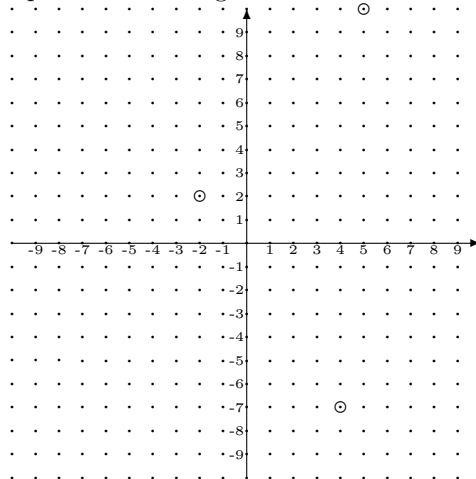
145: [$\lambda \cdot (-1, 2, 3)$]

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

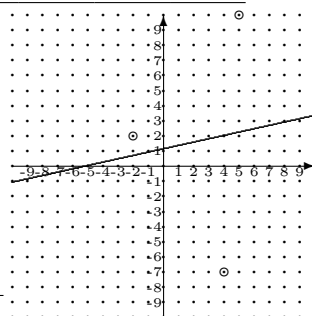
Name: _____

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** ,

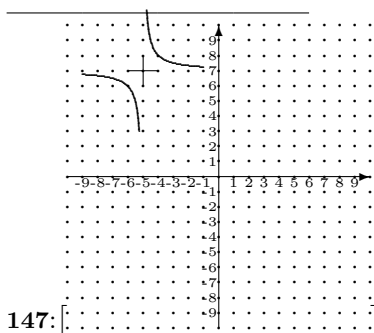
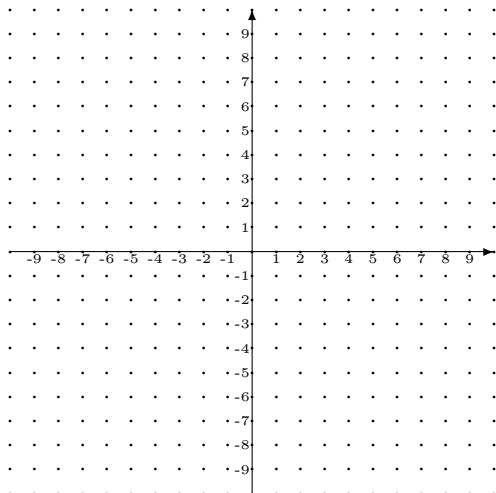
Name:

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:

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

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

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

Name:

Var.:149. Group:

Day/Mo/Year:

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

149: [0]

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

Name:

Var.:150. Group:

Day/Mo/Year:

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

Answer: _____

150: [7]

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

Name:

Var.:151. Group:

Day/Mo/Year:

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

Answer: _____

151: [e^{15}]

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

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

/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: [(2; -7)]

/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: [(2; -5)]

/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 $1 \leq x \leq 5$.

Answer: _____

155: [(3, 1), (5, 21)]

[/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]

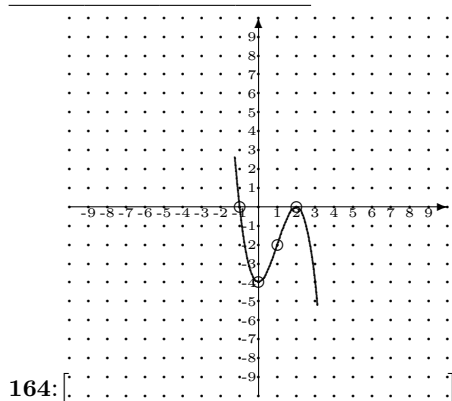
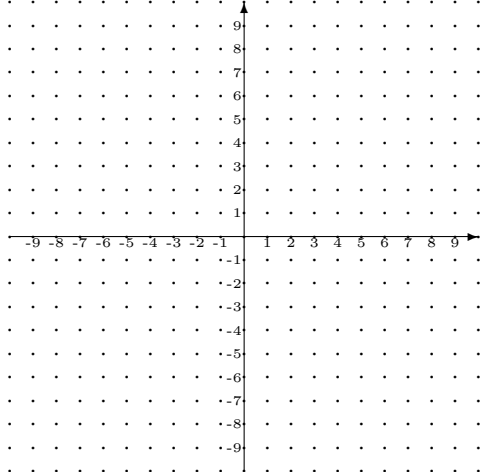
/en/Mathematical analysis/Plotting function, Internal name: **ZpiciZ** ,

Name:

Var.:**164**. Group:

Day/Mo/Year:

Draw the graph of function $y = (-1) \cdot (x - 2)^2 \cdot (x + 1)$, 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:

$$\int_{-2}^1 (-9 \cdot x^2 - 8 \cdot x + 3) dx =$$

165: [-6]

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

Name:

Var.:**166**. Group:

Day/Mo/Year:

$$\int \frac{-x + 7}{x^2 + 6 \cdot x + 5} dx =$$

166: [2 ln(x + 1) - 3 ln(x + 5)]

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

Name:

Var.:**167**. Group:

Day/Mo/Year:

$$\int \frac{4 \cdot x^3 - 7 \cdot x^2 - 26 \cdot x + 28}{x^2 - x - 6} dx =$$

167: [2x² - 3x - 1 ln(x - 3) - 4 ln(x + 2)]

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

Name:

Var.:**168**. Group:

Day/Mo/Year:

$$\int \frac{-7 \cdot x^2 - 14 \cdot x + 8}{(x + 2) \cdot (x^2 - 4)} dx =$$

168: [-4 ln(x + 2) + 2/(x + 2) - 3 ln(x - 2)]

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

Name:

Var.:**169**. Group:

Day/Mo/Year:

$$\int \frac{-4 \cdot x - 26}{x^2 + 14 \cdot x + 50} dx =$$

169: [-2 ln(x² + 14 · x + 50) + 2 arctg(x + 7)]

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

Name:

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

$$\int \frac{4 \cdot x - 4}{x^2 - 8 \cdot x + 32} dx =$$

170: [2 ln(x^2 - 8 · x + 32) + 3 arctg((x - 4)/4)]

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

Name:

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

$$\int \frac{-4 \cdot x^3 - 27 \cdot x^2 - 52 \cdot x - 14}{x^2 + 6 \cdot x + 10} dx =$$

171: [-2 · x^2 - 3 · x + 3 ln(x^2 + 6 · x + 10) - 2 arctg(x + 3)]

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

Name:

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

$$\int (-4 \cdot x + 1) \cdot e^{(2 \cdot x + 5)} dx =$$

172: [(-2x + 1/2)e^(2x+5) - 1e^(2x+5)]

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

Name:

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

$$\int_0^{\pi/6} 6 \cdot \frac{\sin x}{\cos^3 x} dx =$$

173: [1]

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

Name:

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

Find the area of the figure bounded by lines $y = 2 \cdot x^2 + 12 \cdot x + 15$ and $y = -2 \cdot x^2 - 8 \cdot x - 1$.

Answer:

174: [18]

/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: [891 · π]

/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: [136 · π]

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

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: [90]

/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: [26]

/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: [26]

/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: [6]

/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: [20]

/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: [0.0807692]

/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: [2 \cdot x^2 + 2 \cdot x - 2]

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

Name:

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

Calculate $\sqrt{5.7}$ approximately, by Newton, with an accuracy of three decimal places. (Start approximation with $x = 1$);

Answer: _____

185: [x2 = 3.35, x3 = 2.52575, x4 = 2.39125,]

/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/y | 3 | 2.65 | 2.575 | 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: [-3.504]

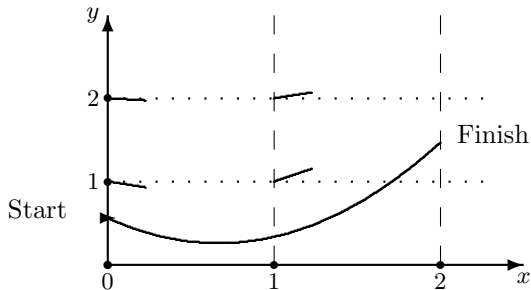
/en/Approximate calculation/Euler method, Internal name: **ZdifureilerZ**,

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: [(2, 1.468)]

13 Informatics.

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

Name:

Var.:**189**. Group:

Day/Mo/Year:

In 18-th number system the number is 7H8. What is it equal to in 7-th system? What is equal in decimal?

Answer: _____

189: [10346, 2582]

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

Name:

Var.:**190**. Group:

Day/Mo/Year:

Eight-bit integers are used. The additional code is 21. Find the hexadecimal entry of the additional code of the opposite number.

Answer: _____

190: [DF]

/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 -53 .

Answer: _____

191: [CB]

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

Name:

Var.:**192**. Group:

Day/Mo/Year:

In the binary system the number is 1101.0111
What is it in decimal?

Answer: _____

192: [13.4375 = 1101.0111]

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

Name:

Var.:**193**. Group:

Day/Mo/Year:

In the decimal system the number is 11.3125
What is it in binary?

Answer: _____

193: [11.3125 = 1011.0101]

/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: _____

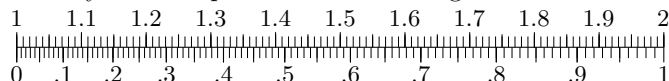
197:[−5.5 = 1/10000001/011000000000000000000000]

/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: _____

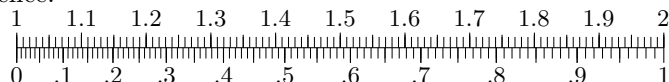
198:[0.881]

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

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: **Zpref-CodZ** ,

Name:

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

The code is given by table a-100 b-11 c-101 d-0. Decode 111011101000000110011010100100100

Answer: _____

200:[bcbdadddd bdbdcdadaa]

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

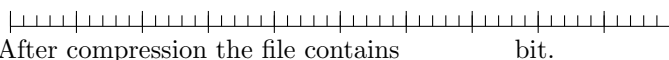
Name:

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

Compress this file abcdcccadc bcdccdadcdc using Huffman's algorithm.

Answer: Table: a[] b[] c[] d[]

Result after compression:



201:[Table: a-010 b-011 c-00 d-1, compression Result: 0100110011100010100011100111010100100, 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 aababbccbbbaa 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 aababaaaaabaaaaabaaaaacbaaa 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: _____

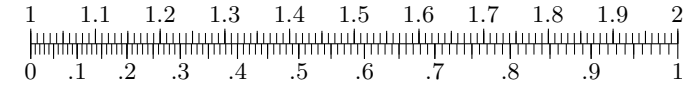
205:[Source file: bbababcbbbbbcbcb. Dictionary: (0-a) (1-b) (2-c) (3-d) (4-bb) (5-ba) (6-ab) (7-bab) (8-bc) (9-cb) (10-bbb) (11-bbbc) (12-cbc).]

/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: **ZkodHemmiZ** ,

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/Automata and words, Internal name: **ZatmAcceptZ**, Moodle computable

Name:

Var.:**210**. Group:

Day/Mo/Year:

Given the state machine

	1	2	3	4	5
a	1	2	1	4	5
b	1	5	2	1	4

with initial state: 3 and acceptable states: 2, 3, 4, 5. Select accepted word

- 1) bbbaaab
- 2) baaabb
- 3) abaaab
- 4) abbbbbb
- 5) ababba

Answer:

210: [2]

/en/Discrete mathematics/Regular expressions and words, Internal name: **ZregExAcceptZ**, Moodle computable

Name:

Var.:**211**. Group:

Day/Mo/Year:

A regular expression is given

$$(ab \cup ba)^*(a \cup b(b \cup \lambda))$$

What word corresponds to it?

- 1) bbaaba
- 2) abbaaba
- 3) babaaa
- 4) bababa
- 5) babbab

Answer:

211: [2]

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

Name:

Var.:**212**. Group:

Day/Mo/Year:

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

Answer:

$$\mathbf{212:} \left[\left(\begin{array}{c|ccccc} & 1 & 2 & 3 & 4 \\ \hline a & 4 & 4 & 2 & 4 \\ b & 4 & 3 & 1 & 4 \end{array} \right), \text{In: 2, Out: 1.} \right]$$

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

Name:

Var.:**213**. Group:

Day/Mo/Year:

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

Answer:

$$\mathbf{213:} \left[\left(\begin{array}{c|ccc} & 1 & 2 & 3 \\ \hline a & 2 & 3 & 3 \\ b & 3 & 1 & 3 \end{array} \right), \text{In: 2, Out: 1.} \right]$$

/en/Discrete mathematics/Regular expressions and automata (**4 vertices**), Internal name: **ZautomatiiZ**, Building an automaton for the regular expression

Name:

Var.:**214**. Group:

Day/Mo/Year:

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

Answer:

$$\mathbf{214:} \left[\left(\begin{array}{c|cccc} & 1 & 2 & 3 & 4 \\ \hline a & 1 & 4 & 1 & 3 \\ b & 1 & 3 & 1 & 1 \end{array} \right), \text{In: 2, Out: 2, 3, 4.} \right]$$

/en/Discrete mathematics/Regular expressions and automata (**5 vertices**), Internal name: **ZautomatiiiZ**, Building an automaton for the regular expression

Name:

Var.:**215**. Group:

Day/Mo/Year:

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

Answer:

$$\mathbf{215:} \left[\left(\begin{array}{c|ccccc} & 1 & 2 & 3 & 4 & 5 \\ \hline a & 1 & 4 & 1 & 3 & 1 \\ b & 1 & 1 & 1 & 5 & 3 \end{array} \right), \text{In: 2, Out: 2, 3, 4.} \right]$$

/en/Discrete mathematics/Regular expressions and automata (**6 vertices**), Internal name: **ZautomatiiiiZ**, Building an automaton for the regular expression

Name:

Var.:**216**. 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:

$$\mathbf{216:} \left[\left(\begin{array}{c|cccccc} & 1 & 2 & 3 & 4 & 5 & 6 \\ \hline a & 2 & 5 & 1 & 4 & 5 & 3 \\ b & 2 & 5 & 1 & 5 & 5 & 4 \end{array} \right), \text{In: 6, Out: 2, 4, 6.} \right]$$

/en/Discrete mathematics/Regular expressions and automata (7 vertices), Internal name: **ZautomatiiiiZ**, Building an automaton for the regular expression

Name:

Var.:**217**. Group: Day/Mo/Year:

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

Answer:

$$\mathbf{217:} \left[\begin{array}{c|cccccc} & 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ a & 2 & 4 & 3 & 6 & 5 & 5 & 1 \\ b & 1 & 2 & 5 & 4 & 5 & 5 & 3 \end{array} \right], \text{ In: } 7, \text{ Out: } 1, 3, 6.]$$

/en/Discrete mathematics/Minimization of the state machine, Internal name: **ZminautZ**, Six peaks. After minimization - four

Name:

Var.:**218**. Group: Day/Mo/Year:

To minimize the state machine

	1	2	3	4	5	6
a	4	6	3	6	2	3
b	5	6	6	6	3	3

In: 1, Out: 2, 4, 5.

$$\mathbf{218:} \left[\begin{array}{c|cccc} & (1) & (24) & (36) & (5) \\ a & (24) & (36) & (36) & (24) \\ b & (5) & (36) & (36) & (36) \end{array} \right], \text{ In: } (1), \text{ Out: } (24), (5).]$$

/en/Discrete mathematics/Minimization of the state machine (large), Internal name: **ZminautiZ**, Nine peaks. After minimization - five

Name:

Var.:**219**. Group: Day/Mo/Year:

To minimize the state machine

	1	2	3	4	5	6	7	8	9
a	2	8	3	5	6	3	5	3	5
b	4	7	3	9	6	6	8	6	5

In: 1, Out: 2, 4, 5, 7, 8, 9.

$$\mathbf{219:} \left[\begin{array}{c|ccccc} & (1) & (24) & (36) & (58) & (79) \\ a & (24) & (58) & (36) & (36) & (58) \\ b & (24) & (79) & (36) & (36) & (58) \end{array} \right], \text{ In: } (1), \text{ Out: } (24), (58), (79).]$$

/en/Discrete mathematics/ Parsing grammar **LL(1)**, Internal name: **ZgrammLLiZ**, Parsing LL(1) grammar

Name:

Var.:**220**. Group: Day/Mo/Year:

Given LL (1) grammar:

		FIRST
S	AB	
S	ac	
A	dS	
A	cb	
B	SS	
B	bb	

Define FIRST and construct a syntax tree for the word ddacbbbb.

220: [FIRST: cd, a, d, c, acd, b, Tree: (S (A d (S (A d (S ac)) (B bb))) (B bb)).]

15 Coding.

/en/Coding/Error correction, Internal name: **ZprmatrrZ** ,

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 0 0 0 0 0 1 0 1 1 1 0 1 1 1 1 0 0 0 . Find the test matrix, correct errors and decode.

$$K = \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 \\ 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 \end{pmatrix} \quad P =$$

Answer: _____

221: [(0 1 1 1, 1 1 0 1, 1 0 0 1)]

/en/Coding/Error correction (complex), Internal name: **ZprmatrrrZ** ,

Name:

Var.:**222**. Group: Day/Mo/Year:

The coding matrix K is given. Over the communication channel it is: 1 0 1 1 1 1 1 0 0 1 1 1 0 0 1 1 1 1 1 1 0 1 1 1 0 1 1 . Find the test matrix, correct errors and decode.

$$K = \begin{pmatrix} 0 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 \\ 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 1 & 0 \end{pmatrix} \quad P =$$

Answer: _____

222: [(0 1 0 1 1, 1 0 1 1 1, 0 1 1 1 0)]

/en/Coding/Error correction only, Internal name: **ZprmatrrrZ** ,

Name:

Var.:**223**. Group: Day/Mo/Year:

The coding matrix K is given. Over the communication channel it is: 1 1 0 1 0 1 1 0 1 0 1 1 1 1 1 1 0 1 0 0 0 0 1 0 . Find the test matrix, correct errors.

$$K = \begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}$$

Answer: _____

223: [(1 1 0 1 0 0 1 0, 1 0 1 1 1 0 1 1, 0 1 0 0 0 1 1 0)]

/en/Coding/Decoding, Internal name: **ZBdecodiZ** ,

Name:

Var.:**224**. Group: Day/Mo/Year:

The coding matrix K is given. Find the decoding matrix D and decode the code words $a^T = (1 1 1 1 1 1 0)$, $b^T = (0 1 0 0 0 1 0)$ and $c^T = (1 0 0 0 0 0 0)$.

$$K = \begin{pmatrix} 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix} \quad D =$$

$$(Da)^T =$$

$$(Db)^T =$$

$$(Dc)^T =$$

224: [(0 0 1 0), (1 1 1 1), (1 0 1 1)]

/en/Coding/The core of the matrix (simple), Internal name: **ZBkeriZ** ,

Name:

Var.:**225**. Group: Day/Mo/Year:

Find a basis of the kernel of a matrix over a field F_2 :

$$\begin{pmatrix} 1 & 0 & 1 & 0 \\ 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \end{pmatrix}$$

Answer: _____

225: [(1 x_3 , 0 x_3 + 1 x_4 , x_3 , x_4)]

16 Cryptography.

[/en/Cryptography/A small fraction](#), Internal name:

[ZBigFraciZ](#),

Name:

Var.:**226**. Group: Day/Mo/Year:

Write the answer in the form of an irreducible fraction.

$$\frac{152}{187} - \frac{95}{119} = \left(\frac{\quad}{\quad} \right)$$

226:[19/1309]

[/en/Cryptography/Fractions Are Large](#), Internal name: [ZBigFraciiZ](#),

Name:

Var.:**227**. Group: Day/Mo/Year:

Write the answer in the form of an irreducible fraction.

$$\frac{70906}{68021} - \frac{62995}{60433} = \left(\frac{\quad}{\quad} \right)$$

227:[293/15168683]

[/en/Cryptography/Inverse number](#), Internal name: [ZobratzZ](#),

Name:

Var.:**228**. Group: Day/Mo/Year:

Solve the equation in \mathbb{Z}_{5483} :

$$1352 \cdot x + 4571 = 0$$

Answer: _____

228:[$x = 390$]

[/en/Cryptography/Inverse number \(Prime\)](#), Internal name: [Zobratz1Z](#),

Name:

Var.:**229**. Group: Day/Mo/Year:

Solve the equation in \mathbb{Z}_{41} :

$$31 \cdot x + 14 = 0$$

Answer: _____

229:[$x = 26$]

[/en/Cryptography/Inverse number \(very simple\)](#), Internal name: [Zobratz2Z](#),

Name:

Var.:**230**. Group: Day/Mo/Year:

Solve the equation in \mathbb{Z}_{100} :

$$49 \cdot x + 64 = 0$$

Answer: _____

230:[$x = 64$]

[/en/Cryptography/Encryption backpack](#), Internal name: [ZrukzakiZ](#),

Name:

Var.:**231**. Group: Day/Mo/Year:

The secret key for cryptography based on the backpack packing is given: (1587, 10000 and 34 72 148 305 618 1245) (1) Decrypt encryption 16321, (2) to generate the corresponding public key to encrypt, (3) encrypt message 010011.

Answer: _____

231:[b=523; Key=7782 7656 7404 9515 3214 1135 ; Crypt=12005; Mess=101001;]

[/en/Cryptography/Encryption by backpack \(with hint\)](#), Internal name: [ZrukzakiiZ](#),

Name:

Var.:**232**. Group: Day/Mo/Year:

The secret key for cryptography based on the backpack packing is given: (4977, 10000 and 37 74 152 308 620 1246) (1) Decrypt encryption 21220, (2) to generate the corresponding public key to encrypt, (3) encrypt message 101100. (Hint: $10000 \cdot (-4436) + 4977 \cdot (8913) = 1$)

Answer: _____

232:[b=8913; Key=9781 9562 4776 5204 6060 5598 ; Crypt=19761; Mess=010011;]

[/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.:**233**. Group: Day/Mo/Year:

Given the isomorphism: $\mathbb{Z}_5 \times \mathbb{Z}_{13} \rightarrow \mathbb{Z}_{65}$. Find a match: (;) \rightarrow (48) and (4; 8) \rightarrow ().

233:[(3; 9) \rightarrow (48), (4; 8) \rightarrow (34)]

[/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.:**234**. Group: Day/Mo/Year:

Given the isomorphism: $\mathbb{Z}_{53} \times \mathbb{Z}_{59} \rightarrow \mathbb{Z}_{3127}$. Find a match: (;) \rightarrow (1342) and (19; 15) \rightarrow ().

234:[(17; 44) \rightarrow (1342), (19; 15) \rightarrow (2139)]

/en/Cryptography/RSA, Internal name: **ZrsaZ** ,

Name:

Var.:**235**. Group: Day/Mo/Year:

Solve the equation $x^3 = 5573$ in \mathbb{Z}_{57949} .
(Hint: $57949 = 167 \cdot 347$, 167 and 347 — Prime number, $167 \cdot (-187) + 347 \cdot (90) = 1$, $62^{111} \% 167 = 89$, $76^{120} \% 347 = 244$, $21^{451} \% 347 = 262$, $21^{52} \% 347 = 42$, $62^{180} \% 167 = 16$, $89^{130} \% 167 = 115$, $21^{231} \% 347 = 76$, $62^{198} \% 167 = 133$.)

Answer: _____

235:[423]

/en/Cryptography/RSA (simple), Internal name: **Zr-saiZ** ,

Name:

Var.:**236**. Group: Day/Mo/Year:

Solve the equation $x^3 = 7$ in \mathbb{Z}_{85} .
(Hint: $85 = 5 \cdot 17$, 5 and 17 — Prime number, $5 \cdot (-10) + 17 \cdot (3) = 1$, $2^3 \% 5 = 3$, $7^{11} \% 17 = 14$.)

Answer: _____

236:[48]

/en/Cryptography/RSA (without hint), Internal name: **ZrsatZ** ,

Name:

Var.:**237**. Group: Day/Mo/Year:

Solve the equation $x^3 = 49$ in \mathbb{Z}_{187} .
(Hint: $187 = 17 \cdot 11$, 17 and 11 — Prime number.)

Answer: _____

237:[179]

/en/Cryptography/El Gammal Encryption, Internal name: **ZElGamalcZ** ,

Name:

Var.:**238**. Group: Day/Mo/Year:

The El Gammal cryptosystem with \mathbb{Z}_{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: 28.

1. Decrypt: crypt: 11, hint: 6.

Answer: ()

2. Generate the public key. Answer: ()

3. Encrypt message 19 (as random numbers use 4).

Answer: Crypt: (), Hint: ().

238:[Message: 24, public key: 7 Crypt: (18, 19).]

/en/Cryptography/Signed By El Gammal, Internal name: **ZElGamalsZ** ,

Name:

Var.:**239**. Group: Day/Mo/Year:

The El Gammal cryptosystem with \mathbb{Z}_{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: 17.

Sign message 6 (as random numbers use 29).

Answer: Sign: (), hint: ().

239:[(21, 21).]

17 Differential equation. Here are the differential equations.

/en/Differential equation/Approximate solution, Internal name: **ZpriblduZ** ,

Name:

Var.:**240**. Group: Day/Mo/Year:

Find an approximate solution to the Cauchy problem:

$$y''' = 4 \cdot y' \cdot y + 4 \cdot y \cdot x,$$

$y(2) = 9, y'(2) = -9, y''(2) = 6$. Write the answer in the form of a series of Taylor to the fourth power of the summand inclusive.

Answer: _____

$$\mathbf{240:} [y = 9 - 9 \cdot (x - 2) + 3 \cdot (x - 2)^2 - 42 \cdot (x - 2)^3 + 21 \cdot (x - 2)^4]$$

/en/Differential equation/Simple Cauchy task, Internal name: **ZkoshiZ** ,

Name:

Var.:**241**. Group: Day/Mo/Year:

Solve the Cauchy problem: $x \cdot y' + 3 = y, y(-9) = -69$.

Answer: _____

$$\mathbf{241:} [y = 8x + 3]$$

/en/Differential equation/Integrating factor, Internal name: **ZIntMnozZhZ** ,

Name:

Var.:**242**. Group: Day/Mo/Year:

Find the general solution of the differential equation

$$(3 \cdot x^2 \cdot y^3) dx + (5 \cdot x^3 \cdot y^2 + 4 \cdot y^1) dy = 0$$

Answer: _____

$$\mathbf{242:} [1x^3y^5 + 1y^4 = c, y^2]$$

/en/Differential equation/Linear first order, Internal name: **ZlinduiZ** ,

Name:

Var.:**243**. Group: Day/Mo/Year:

Find the general solution of the differential equation: $y' = \frac{y + 8 \cdot x - 7}{x + 3}$

Answer: _____

$$\mathbf{243:} [y = 8(x + 3)\ln(x + 3) + C(x + 3) + 31]$$

/en/Differential equation/Linear homogeneous with post 2nd order coefficient, Internal name: **Zlopk2Z** ,

Name:

Var.:**244**. Group: Day/Mo/Year:

Find the general solution of the differential equation:

$$y'' - 4 \cdot y = 0$$

Answer: _____

$$\mathbf{244:} [C_1 \cdot e^{-2x} + C_3 \cdot e^{2x}]$$

/en/Differential equation/Linear homogeneous with post coefficient of the 3rd order, Internal name: **Zlopk3Z** ,

Name:

Var.:**245**. Group: Day/Mo/Year:

Find the general solution of the differential equation:

$$y''' + y'' - 21 \cdot y' - 45 \cdot y = 0$$

Answer: _____

$$\mathbf{245:} [C_1 \cdot e^{-3x} + C_2 \cdot x \cdot e^{-3x} + C_3 \cdot e^{5x}]$$

/en/Differential equation/Linear mixed post coeff 2nd order, Internal name: **Zlnpk2Z** ,

Name:

Var.:**246**. Group: Day/Mo/Year:

Find the general solution of the differential equation:

$$y'' - 6 \cdot y' + 9 \cdot y = 45 \cdot x^2 - 96 \cdot x + 34$$

Answer: _____

$$\mathbf{246:} [C_1 \cdot e^{3x} + C_2 \cdot x \cdot e^{3x} + (5 \cdot x^2 - 4 \cdot x)]$$

/en/Differential equation/Linear mixed post coeff complex, Internal name: **ZlnpkiZ** ,

Name:

Var.:**247**. Group: Day/Mo/Year:

Find the general solution of the differential equation:

$$y'' + 5 \cdot y' + 6 \cdot y = 6 \cdot e^{-1x} - 50 \cdot \cos(-4x)$$

Answer: _____

$$\mathbf{247:} [C_1 \cdot e^{-3x} + C_2 \cdot e^{-2x} + (3 \cdot e^{-1x} + 1 \cdot \cos(-4x) + 2 \cdot \sin(-4x))]$$

/en/Differential equation/The linear non-uniform post-coefficient is very complex, Internal name: **ZlnpkiiZ** ,

Name:

Var.:**248**. Group: Day/Mo/Year:

Find the general solution of the differential equation:

$$y'' - 5 \cdot y' + 6 \cdot y = -30 \cdot x + 7 - 1 \cdot e^{2x}$$

Answer: _____

$$\mathbf{248:} [C_1 \cdot e^{3x} + C_2 \cdot e^{2x} + (-5 \cdot x - 3 + 1 \cdot x \cdot e^{2x})]$$

/en/Differential equation/Linear inhomogeneous with post factors is very complex 2, Internal name: **ZlnpkiiiZ** ,

Name:

Var.:**249**. Group: Day/Mo/Year:

Find the general solution of the differential equation:

$$y'' - 6 \cdot y' = 36 \cdot x^2 - 48 \cdot x + 30$$

Answer: _____

$$\mathbf{249:} [C_1 \cdot e^{6x} + C_2 + (-2 \cdot x^3 + 3 \cdot x^2 - 4 \cdot x)]$$

/en/Differential equation/Homogeneous first order, Internal name: **ZodnordifuriZ**,

Name:

Var.:**250**. Group: Day/Mo/Year:

Find the particular solution of the differential equation $x \cdot y \cdot y' = 7 \cdot y^2 - 18 \cdot x^2$, satisfying the condition $y(1) = 5$

Answer: _____

250: $[y = \sqrt{3 \cdot x^2 + 22 \cdot x^{14}}]$

/en/Differential equation/Allowing the reduction, Internal name: **ZdifurUmenStepZ**,

Name:

Var.:**251**. Group: Day/Mo/Year:

Find the general solution of the differential equation: $y \cdot y'' = 3(y')^2 - (y')^3$

Answer: _____

251: $[y + \frac{C_1}{y^2} = 3x + C_2]$

/en/Differential equation/Bernulli, Internal name: **ZbernulliZ**,

Name:

Var.:**252**. Group: Day/Mo/Year:

Find the general solution of

$$y' = -5 \cdot y + e^{-1 \cdot x} \cdot y^{-5}$$

Answer: _____

252: $[y^6 = C \cdot e^{-30 \cdot x} + \frac{6}{29} \cdot e^{-1 \cdot x}]$

/en/Differential equation/Bernulli with answer, Internal name: **ZbernullimZ**, Moodle computable

Name:

Var.:**253**. Group: Day/Mo/Year:

Find the general solution of

$$y' = -6 \cdot y + e^{-4 \cdot x} \cdot y^{-1}$$

1. $y^1 = C \cdot e^{6 \cdot x} + \frac{-1}{8} \cdot e^{-4 \cdot x}$
2. $y^2 = C \cdot e^{-12 \cdot x} + \frac{-1}{8} \cdot e^{-4 \cdot x}$
3. $y^2 = C \cdot e^{-12 \cdot x} + \frac{1}{4} \cdot e^{-4 \cdot x}$
4. $y^1 = C \cdot e^{6 \cdot x} + \frac{-1}{4} \cdot e^{-4 \cdot x}$

Answer: _____

253: [3]

/en/Differential equation/Ricatti, Internal name: **ZricattiZ**,

Name:

Var.:**254**. Group: Day/Mo/Year:

Find the general solution of

$$y' = 5 \cdot x^2 \cdot y \cdot (y - 6 \cdot x^{-3}) - 18 \cdot x^{-4}$$

Answer: _____

254: $[y = \frac{33}{C \cdot x^{-30} - 5 \cdot x^3} + 6 \cdot x^{-3}]$

/en/Differential equation/Ricatti with answer, Internal name: **ZricattimZ**, Moodle computable

Name:

Var.:**255**. Group: Day/Mo/Year:

Find the general solution of

$$y' = 10 \cdot x^{-4} \cdot y \cdot (y - 5 \cdot x^3) + 15 \cdot x^2$$

1. $y = \frac{-47}{C \cdot x^{-50} + 5 \cdot x^3} + 5 \cdot x^3$
2. $y = \frac{-47}{C \cdot x^{-3} - 50 \cdot x^{-50}} + 5 \cdot x^3$
3. $y = \frac{47}{C \cdot x^{-50} - 10 \cdot x^{-3}} + 5 \cdot x^3$
4. $y = \frac{47}{C \cdot x^3 + 3 \cdot x^{50}} + 5 \cdot x^3$

Answer: _____

255: [3]

/en/Differential equation/Lagranj, Internal name: **ZlagranjZ**,

Name:

Var.:**256**. Group: Day/Mo/Year:

Find the general solution of

$$-3 \cdot y = y' \cdot (-6 + 10 \cdot y') \cdot x - 27 \cdot \ln |y'|$$

Answer: _____

256: $[\begin{cases} x = (C + \frac{27}{7} \cdot \ln |p + \frac{-3}{10}|) \cdot p^{-2}, \\ y = (2 + \frac{-10}{3} \cdot p) \cdot (C + \frac{27}{10} \cdot \ln |p + \frac{-3}{10}|) \cdot p^{-1} + 9 \cdot \ln |p|. \end{cases}]$

/en/Differential equation/Lagranj with answer, Internal name: **ZlagranjmZ**, Moodle computable

Name:

Var.:**257**. Group: Day/Mo/Year:

Find the general solution of

$$-3 \cdot y = y' \cdot (-6 - 7 \cdot y') \cdot x - 15 \cdot \ln |y'|$$

1. $\begin{cases} x = (C + \frac{-15}{7} \cdot \ln |p|) \cdot (2 + \frac{7}{3} \cdot p)^{-2}, \\ y = (C + \frac{-15}{7} \cdot \ln |p|) \cdot p \cdot (2 + \frac{7}{3} \cdot p)^{-1} + 5 \cdot \ln |p|. \end{cases}$
2. $\begin{cases} x = (C + \frac{-13}{7} \cdot \ln |p|) \cdot (2 + \frac{7}{3} \cdot p)^{-2}, \\ y = (C + \frac{-13}{7} \cdot \ln |p|) \cdot p \cdot (2 + \frac{7}{3} \cdot p)^{-1} + 5 \cdot \ln |p|. \end{cases}$
3. $\begin{cases} x = (C + \frac{-13}{7} \cdot \ln |p + \frac{3}{7}|) \cdot p^{-2}, \\ y = (2 + \frac{7}{3} \cdot p) \cdot (C + \frac{-13}{7} \cdot \ln |p + \frac{3}{7}|) \cdot p^{-1} + 5 \cdot \ln |p|. \end{cases}$
4. $\begin{cases} x = (C + \frac{-15}{7} \cdot \ln |p + \frac{3}{7}|) \cdot p^{-2}, \\ y = (2 + \frac{7}{3} \cdot p) \cdot (C + \frac{-15}{7} \cdot \ln |p + \frac{3}{7}|) \cdot p^{-1} + 5 \cdot \ln |p|. \end{cases}$

Answer: _____

257: [4]

/en/Differential equation/Klero, Internal name: **ZkleroZ**, Moodle computable

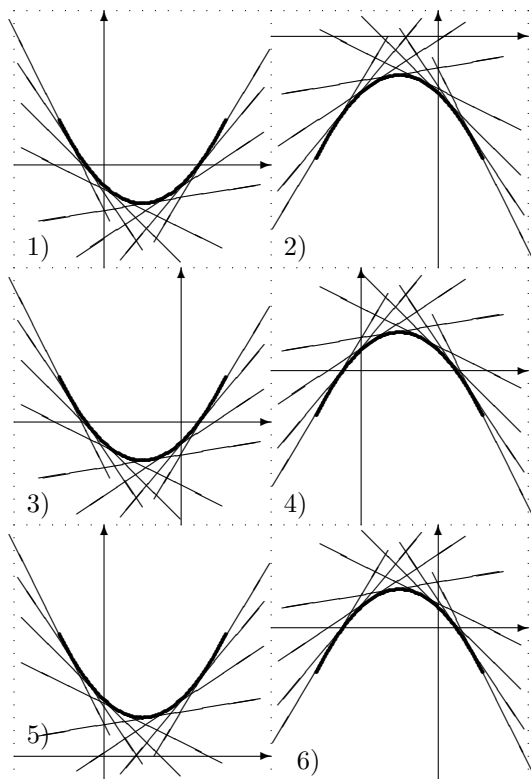
Name:

Var.:**258**. Group:

Day/Mo/Year:

Which of the figures shows some solutions of the following differential equation

$$y = y' \cdot (x + 6 \cdot y' + 11) - 12$$



Answer: _____

258: [2]

/en/Differential equation/Ortogonal fem, Internal name: **ZortFmZ**, Moodle computable

Name:

Var.:**259**. Group:

Day/Mo/Year:

One of the curves orthogonal to the family

$$y^4 = \frac{C}{x+8}$$

passes through the point $(1, \sqrt{78})$ and intersects the axis OY at the point $(0, t)$. Find t .

Answer: _____

259: [$\sqrt{10}$]

/en/Differential equation/Linear Simple, Internal name: **ZlinSmplZ**, Moodle computable

Name:

Var.:**260**. Group:

Day/Mo/Year:

A particular solution $y(x)$ of the differential equation

$$y' + 4y \tan x = 5 \cos^2 x \cdot \sin x$$

satisfies the condition $y(\frac{2\pi}{3}) = \frac{27}{64}$. Find $y(0)$ for the solution.

Answer: _____

260: [6]

/en/Differential equation/Integrating factor simple, Internal name: **ZintMnTstZ**, Moodle computable

Name:

Var.:**261**. Group:

Day/Mo/Year:

The general solution of the differential equation

$$(8 \cdot x^1 \cdot y^3 - 20 \cdot x^2) dx + (6 \cdot x^2 \cdot y^2) dy = 0$$

is written in the form $Ax^\alpha y^\beta + Bx^\gamma y^\delta = Const$. Find the sum $\alpha + \beta + \gamma + \delta$.

Answer: _____

261: [12]

/en/Differential equation/System of homogeneous equations 2x2, Internal name: **ZsisOdnorDifurZ**, Moodle computable

Name:

Var.:**262**. Group:

Day/Mo/Year:

Find the solution of the system

$$\begin{cases} y_1' = 5 \cdot y_1 + 2 \cdot y_2 \\ y_2' = -6 \cdot y_1 + 12 \cdot y_2 \end{cases}$$

Answer: _____

$$\mathbf{262:} \left[\begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = C_1 \cdot e^{9 \cdot x} \cdot \begin{pmatrix} 1 \\ 2 \end{pmatrix} + C_2 \cdot e^{8 \cdot x} \cdot \begin{pmatrix} -2 \\ -3 \end{pmatrix} \right]$$

/en/Differential equation/System of homogeneous equations 2x2 with choice of the answer, Internal name: **ZsisOdnorDifurmZ**, Moodle computable

Name:

Var.:**263**. Group:

Day/Mo/Year:

Find the solution of the system

$$\begin{cases} y_1' = -4 \cdot y_1 + 6 \cdot y_2 \\ y_2' = -9 \cdot y_1 + 11 \cdot y_2 \end{cases}$$

$$1. \begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = C_1 \cdot e^{5 \cdot x} \cdot \begin{pmatrix} -1 \\ -1 \end{pmatrix} + C_2 \cdot e^{2 \cdot x} \cdot \begin{pmatrix} 2 \\ 3 \end{pmatrix}$$

$$2. \begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = C_1 \cdot e^{2 \cdot x} \cdot \begin{pmatrix} -1 \\ -1 \end{pmatrix} + C_2 \cdot e^{5 \cdot x} \cdot \begin{pmatrix} 2 \\ 3 \end{pmatrix}$$

$$3. \begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = C_1 \cdot e^{2 \cdot x} \cdot \begin{pmatrix} -1 \\ -1 \end{pmatrix} + C_2 \cdot e^{5 \cdot x} \cdot \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

$$4. \begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = C_1 \cdot e^{5 \cdot x} \cdot \begin{pmatrix} -1 \\ -1 \end{pmatrix} + C_2 \cdot e^{2 \cdot x} \cdot \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

Answer: _____

263: [2]

/en/Differential equation/System of equations 2x2, Internal name: ZsisDifurZ , Moodle computable

Name:

Var.:264. Group: Day/Mo/Year:

Find the solution of the system

$$\begin{cases} y_1' = 6 \cdot y_1 - 2 \cdot y_2 - 6 \cdot x + 10 \\ y_2' = 6 \cdot y_1 - 1 \cdot y_2 - 3 \cdot x + 5 \end{cases}$$

Answer:

$$\mathbf{264:} \left[\begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = C_1 \cdot e^{3 \cdot x} \cdot \begin{pmatrix} 2 \\ 3 \end{pmatrix} + C_2 \cdot e^{2 \cdot x} \cdot \begin{pmatrix} -1 \\ -2 \end{pmatrix} + x \cdot \begin{pmatrix} 0 \\ -3 \end{pmatrix} + \begin{pmatrix} -1 \\ 2 \end{pmatrix} \right]$$

/en/Differential equation/System of equations 2x2 with choice of the answer, Internal name: ZsisDifurmZ , Moodle computable

Name:

Var.:265. Group: Day/Mo/Year:

Find the solution of the system

$$\begin{cases} y_1' = 8 \cdot y_1 + 1 \cdot y_2 + 16 \cdot x - 20 \\ y_2' = 3 \cdot y_1 + 6 \cdot y_2 + 6 \cdot x - 18 \end{cases}$$

$$1. \begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = C_1 \cdot e^{5 \cdot x} \cdot \begin{pmatrix} 1 \\ -3 \end{pmatrix} + C_2 \cdot e^{9 \cdot x} \cdot \begin{pmatrix} 1 \\ 1 \end{pmatrix} + x \cdot \begin{pmatrix} 2 \\ 2 \end{pmatrix} + \begin{pmatrix} -2 \\ 0 \end{pmatrix}$$

$$2. \begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = C_1 \cdot e^{9 \cdot x} \cdot \begin{pmatrix} 1 \\ -3 \end{pmatrix} + C_2 \cdot e^{5 \cdot x} \cdot \begin{pmatrix} 1 \\ 1 \end{pmatrix} + x \cdot \begin{pmatrix} 2 \\ 2 \end{pmatrix} + \begin{pmatrix} -2 \\ 0 \end{pmatrix}$$

$$3. \begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = C_1 \cdot e^{9 \cdot x} \cdot \begin{pmatrix} 1 \\ -3 \end{pmatrix} + C_2 \cdot e^{5 \cdot x} \cdot \begin{pmatrix} 1 \\ 1 \end{pmatrix} + x \cdot \begin{pmatrix} -2 \\ 0 \end{pmatrix} + \begin{pmatrix} 2 \\ 2 \end{pmatrix}$$

$$4. \begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = C_1 \cdot e^{5 \cdot x} \cdot \begin{pmatrix} 1 \\ -3 \end{pmatrix} + C_2 \cdot e^{9 \cdot x} \cdot \begin{pmatrix} 1 \\ 1 \end{pmatrix} + x \cdot \begin{pmatrix} -2 \\ 0 \end{pmatrix} + \begin{pmatrix} 2 \\ 2 \end{pmatrix}$$

Answer:

265: [4]

/en/Differential equation/Euler, Internal name: ZEuliiZ , Moodle computable

Name:

Var.:266. Group: Day/Mo/Year:

The differential equation

$$x^2 \cdot y'' + 4 \cdot x \cdot y' + 2 \cdot y = 3 \cdot x^{-1}$$

has a particular solution $y = f(x)$. Find $\lim_{x \rightarrow 0} (f(x) \cdot x^2)$ assuming that $f(1) = 0$, $f'(1) = 6$.

Answer:

266: [lim = -3; $y = -3 \cdot x^{-2} + 3 \cdot x^{-1} + 3 \cdot x^{-1} \cdot \ln x$]

/en/Differential equation/Step-down with tip, Internal name: ZLinPonZ , Moodle computable

Name:

Var.:267. Group: Day/Mo/Year:

The function $y = x^n$ for some n is a particular solution of

$$x \cdot y'' + (-x + 4) \cdot y' + (2 \cdot x^{-1} - 2) \cdot y = 0.$$

Another particular solution $y = f(x)$ satisfies the following conditions

$$\lim_{x \rightarrow 0} \frac{f(x)}{x^n} = -3 \quad \text{and} \quad \lim_{x \rightarrow 0} \left(\frac{f(x)}{x^n} \right)' = -4.$$

Calculate

$$\lim_{x \rightarrow -\infty} \frac{f(x)}{x^n}.$$

Answer:

267: [1]

/en/Differential equation/Second order linear with sin and answer choice, Internal name: ZlnpkimZ , Moodle computable

Name:

Var.:268. Group: Day/Mo/Year:

The Cauchy problem is given:

$$y'' + 10 \cdot y' + 24 \cdot y = -75 \cdot \sin(3x), \quad y(0) = 3, \quad y'(0) = -17.$$

What pattern corresponds to its solution?

1) $y = * \cdot e^{-4x} + 2 \cdot e^{* \cdot x} + * \cdot \cos(* \cdot x) - 1 \cdot \sin(* \cdot x)$

2) $y = * \cdot e^{-4x} - 6 \cdot e^{* \cdot x} + * \cdot \cos(* \cdot x) - 6 \cdot \sin(* \cdot x)$

3) $y = * \cdot e^{-4x} - 6 \cdot e^{* \cdot x} + * \cdot \cos(* \cdot x) - 1 \cdot \sin(* \cdot x)$

4) $y = * \cdot e^{-4x} + 5 \cdot e^{* \cdot x} + * \cdot \cos(* \cdot x) - 1 \cdot \sin(* \cdot x)$

5) $y = * \cdot e^{-4x} + 5 \cdot e^{* \cdot x} + * \cdot \cos(* \cdot x) - 6 \cdot \sin(* \cdot x)$

6) $y = * \cdot e^{-4x} + 2 \cdot e^{* \cdot x} + * \cdot \cos(* \cdot x) - 6 \cdot \sin(* \cdot x)$

(The sign * hides some numbers).

Answer:

268: [4, $y = -4 \cdot e^{-4x} + 5 \cdot e^{-6x} + 2 \cdot \cos(3x) - 1 \cdot \sin(3x)$]

/en/Differential equation/The approximate solution in the form of Taylor series Only the coefficient, Internal name: ZpribldumZ , Moodle computable

Name:

Var.:269. Group: Day/Mo/Year:

The solution of the Cauchy problem

$$y'' + (x - 1) \cdot y' + y = 7 \cdot x + 2,$$

$$y(0) = -7, \quad y'(0) = -2 \text{ has the form}$$

$$y = \sum_{n=0}^{\infty} c_n \cdot x^n.$$

Find the coefficient c_3 .

Answer:

269: [3]

Name:

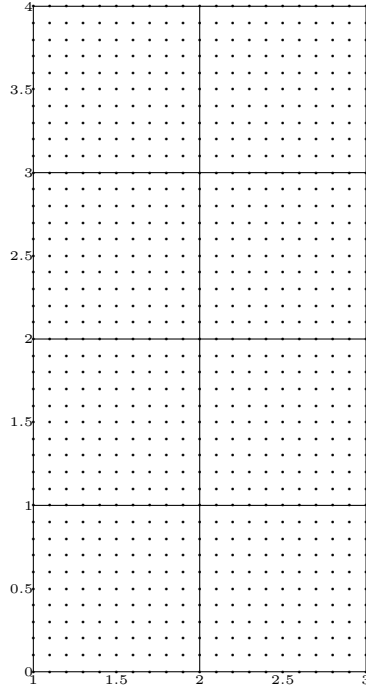
Var.:270. Group:

Day/Mo/Year:

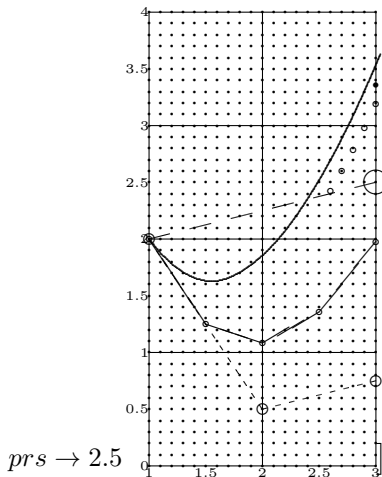
The Cauchy problem is given

$$y' = \frac{y + 3.5 \cdot (x - 1) - 3.5}{x}, \quad y(1) = 2.$$

Find $y(3)$ by the exact method, approximated Euler's method with step 1, 0.5, 0.1 and 0.05 (possible on a computer). And find it by the Euler method with recalculation and a step of 1.



270: $[y = 3.5 \cdot x \cdot \ln x - 5 \cdot x + 7, y(3) = 3.535, sh = 1 \rightarrow 0.75, sh = 0.5 \rightarrow 1.975, sh = 0.1 \rightarrow 3.1932, sh = 0.05 \rightarrow 3.36237,$



18 Theory of probability.

Name:

Var.:271. Group:

Day/Mo/Year:

Probability to pass the exam by answering a simple ticket is $2/3$ while answering a difficult is $1/5$. The student chooses a ticket from a pack in which there are 6 simple and 9 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: _____

271: $[1: \frac{38}{75} = 0.506667, 2: \frac{10}{19} = 0.526316]$

Name:

Var.:272. 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 $2/3$. Find the probability of the victory of good over evil.

Answer: _____

272: $[0.980338]$

Name:

Var.:273. Group:

Day/Mo/Year:

In the basket there are 5 white and 3 black balls. From the basket, 4 balls were taken. What is the probability that they are the same color?

Answer: _____

273: $[\frac{5}{70} = \frac{1}{14} = 0.071]$

Name:

Var.:274. Group:

Day/Mo/Year:

How many ways to choose 9 items from 3 items? How many ways are there to choose 9 items from 3 items?

Answer: _____

274: $[84]$

Name:

Var.:275. Group:

Day/Mo/Year:

Two shooters shoot one hare. The probability of hitting with first arrow is 0.41 and with second it is 0.4. What is the probability that the hare will get shot? What is the probability that there will be two holes in the hare?

Answer: _____

275: $[0.646; 0.164]$

/en/Theory of probability/Expected value and Variance, Internal name: **ZdiskcviZ** ,

Name:

Var.:**276**. Group: Day/Mo/Year:

Random value is given by table

x	1	6	7
p	0.3	0.2	0.5

 Find the expected value and variance.

Answer: _____

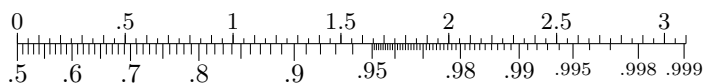
276: $[M = 5, D = 7]$

/en/Theory of probability/Malchish-Kibalchish, Internal name: **ZpulemetZ** ,

Name:

Var.:**277**. Group: Day/Mo/Year:

The Boy-Kibalchish has 1970 ammo. Firing accuracy of the revolutionary machine gun Maxim is 0.33. For the death of the Chief Burzhuin, 666 bullets are enough. What is the probability of the victory of the world Revolution?



Answer: _____

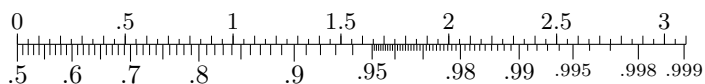
277: $[0.223]$

/en/Theory of probability/De Moivre Laplace, Internal name: **ZterminatorZ** ,

Name:

Var.:**278**. Group: Day/Mo/Year:

It is known that to terminate the Terminator T-1000 is requires 100 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 0.94?



Answer: _____

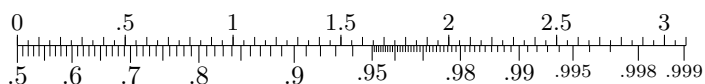
278: $[282]$

/en/Theory of probability/Confidence interval, Internal name: **ZdovintZ** ,

Name:

Var.:**279**. Group: Day/Mo/Year:

Of the 420 conducted, successful experiments ware 210. Find the confidence interval for the probability of success in one experiece. (significance level 0.02).



Answer: _____

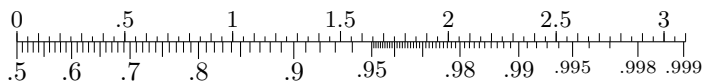
279: $[0.450138, 0.549862]$

/en/Theory of probability/Confidence interval 1, Internal name: **ZstatiZ** ,

Name:

Var.:**280**. Group: Day/Mo/Year:

Produced 9 analyses of a certain substance. Test results: 8.95; 9.01; 8.93; 9.07; 8.94; 8.94; 8.96; 9.04; 9.03. The standard deviation for this type of analysis is 0.1. Significance level is 91%. Find the confidence interval of the measured value.



Answer: _____

280: $[(8.92904; 9.04207)]$

/en/Theory of probability/Confidence interval 2, Internal name: **Zstatiiz** ,

Name:

Var.:**281**. Group: Day/Mo/Year:

5 experiments were made. Results: 4.6; 5.36; 4.96; 4.96; 5.36. Significance level: 90%. Find the sample average, corrected standard deviation and confidence interval of the measured value.

Answer: _____

281: $[5.048; 0.358329; (4.73663; 5.35937)]$

/en/Theory of probability/Sample mean, Internal name: **ZvibsredZ** ,

Name:

Var.:**282**. Group: Day/Mo/Year:

The variation series is given: 1; 4; 5; 8; 12. Find the sample average.

Answer: _____

282: $[6]$

/en/Theory of probability/Parameter in the density function, Internal name: **ZtvEplotniZ** ,

Name:

Var.:**283**. Group: Day/Mo/Year:

The density function of some random variable is given:

$$f(x) = \begin{cases} 0, & x \notin [0; 4] \\ c \cdot x, & x \in [0; 4] \end{cases}$$

Find the value of the c parameter. Find the distribution function.

Answer: _____

283: $[\frac{1}{8} \approx 0.125]$

/en/Theory of probability/The expected value of a continuous random variable, Internal name: **ZtvMatOnsviZ** ,

Name:

Var.:**284**. Group: Day/Mo/Year:

The density function of some random variable is given:

$$F(x) = \begin{cases} 0, & x \leq 1 \\ \frac{x^2-1}{35}, & 1 < x \leq 6 \\ 1, & x > 6 \end{cases}$$

Find the expectation.

Answer:

284: $[\frac{86}{21} \approx 4.095]$

19 Graph theory.

/en/Graph theory/The problem of the appointment of 3x3, Internal name: **Zkanmun3Z** ,

Name:

Var.:**285**. Group: Day/Mo/Year:

Solve the problem of optimal assignment. Specify the final layout of the vertices.

	d	e	f	a —
a	5	12	11	b —
b	2	6	12	c —
c	12	13	18	$\sum =$

285: $[\sum = 36, ae, bf, cd]$

/en/Graph theory/The problem of the appointment of 4x4, Internal name: **Zkanmun4Z** ,

Name:

Var.:**286**. Group: Day/Mo/Year:

Solve the problem of optimal assignment. Specify the final layout of the vertices.

	e	f	g	h	a —
a	16	14	15	14	b —
b	7	5	14	9	c —
c	14	7	13	16	d —
d	7	6	14	14	$\sum =$

286: $[\sum = 56, af, bg, ce, dh]$

/en/Graph theory/The problem of the appointment of 5x5, Internal name: **Zkanmun5Z** ,

Name:

Var.:**287**. Group: Day/Mo/Year:

Solve the problem of optimal assignment. Specify the final layout of the vertices.

	f	g	h	i	j	a —
a	19	18	10	8	11	b —
b	23	24	17	13	19	c —
c	27	24	21	19	16	d —
d	17	21	18	10	12	e —
e	14	19	7	3	5	$\sum =$

287: $[\sum = 94, af, bj, ci, dh, eg]$

/en/Graph theory/The problem of the appointment of 6x6, Internal name: **Zkanmun6Z** ,

Name:

Var.:**288**. Group: Day/Mo/Year:

Solve the problem of optimal assignment. Specify the final layout of the vertices.

	g	h	i	j	k	l	a —
a	23	13	7	11	17	22	b —
b	29	26	21	20	31	29	c —
c	21	16	12	12	24	25	d —
d	25	18	17	23	21	31	e —
e	28	23	12	14	18	31	f —
f	19	12	5	9	16	22	$\sum =$

288: $[\sum = 136, ag, bi, ck, dj, eh, fl]$

/en/Graph theory/The problem of the appointment of 7x7, Internal name: **Zkanmun7Z** ,

Name:

Var.:**289**. 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	—
a	27	27	22	25	23	22	13	b	—
b	14	22	8	24	10	11	4	c	—
c	26	32	21	30	19	21	21	d	—
d	14	15	6	22	7	11	3	e	—
e	27	30	15	30	22	20	14	f	—
f	20	24	15	21	13	23	11	g	—
g	23	22	13	20	13	19	9	Σ	=

289: [Σ = 155, aj, bi, cn, dk, el, fm, gh]

/en/Graph theory/Ford-Falkerson, Internal name: **ZffZ** ,

Name:

Var.:**290**. 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. $s \xrightarrow{(9,)} a$, $s \xrightarrow{(9,)} b$, $s \xrightarrow{(5,)} c$, $a \xrightarrow{(4,)} f$, $a \xrightarrow{(1,)} e$, $b \xrightarrow{(2,)} g$, $b \xrightarrow{(4,)} i$, $c \xrightarrow{(1,)} i$, $c \xrightarrow{(2,)} f$, $e \xrightarrow{(3,)} g$, $e \xrightarrow{(2,)} h$, $f \xrightarrow{(4,)} i$, $f \xrightarrow{(3,)} g$, $g \xrightarrow{(5,)} t$, $h \xrightarrow{(8,)} t$, $i \xrightarrow{(5,)} t$, flow=

290: []

20 Financial calculations.

/en/Financial calculations/Size of payments, Internal name: **ZrazmviplZ** ,

Name:

Var.:**291**. Group: Day/Mo/Year:

Nothing

Answer: _____

291: [15593.2]

/en/Financial calculations/Mission, Internal name: **ZkomandirZ** ,

Name:

Var.:**292**. Group: Day/Mo/Year:

Nothing

Answer: _____

292: [14842.1]

/en/Financial calculations/Purchase, Internal name: **ZpokupkvZ** ,

Name:

Var.:**293**. Group: Day/Mo/Year:

Someone plans to buy an apartment in 293000 in 7 years. What amount should he or she put into his or her Bank account monthly if the annual Bank rate is 12%?

Answer: _____

293: [2296.41]

/en/Financial calculations/Rent replacement 1, Internal name: **ZrentaiZ** ,

Name:

Var.:**294**. Group: Day/Mo/Year:

Replace the semi-annual rent with payment 1200 and duration 8 years with quarterly duration 5 years. Annual rate 14%. Interest is charged 3 once a year at regular intervals.

Answer: _____

294: [791.909]

/en/Financial calculations/Rent replacement 2, Internal name: **ZrentaiZ** ,

Name:

Var.:**295**. Group: Day/Mo/Year:

Replace the annual rent with payment 1800 and duration 8 years semi-annual with payment 1500. Annual rate 12%. Interest is charged 4 once a year at regular intervals.

Answer: _____

295: [14.8955]

/en/Financial calculations/Rates and inflation, Internal name: **ZinflstavZ** ,

Name:

Var.:**296**. Group: Day/Mo/Year:

The Bank announced the Deposit 15.5 % per annum. The real rate at the end of the year is 4.5 %. Find quarterly inflation.

Answer: _____

296:[2.53365]

/en/Financial calculations/Rates and inflation 1, Internal name: **Zinflstav1Z** ,

Name:

Var.:**297**. Group: Day/Mo/Year:

The Bank announced the Deposit 18.5 % per annum. The expected rate of inflation 3 %. Find the real annual rate for the Bank's client.

Answer: _____

297:[5.28572]

/en/Financial calculations/Rates and inflation 2, Internal name: **Zinflstav2Z** ,

Name:

Var.:**298**. Group: Day/Mo/Year:

The Bank announced the Deposit 18.5 % per annum. The real rate at the end of the year is 7.5 %. Find quarterly inflation.

Answer: _____

298:[2.46545]

/en/Financial calculations/Rates and inflation 3, Internal name: **Zinflstav3Z** ,

Name:

Var.:**299**. Group: Day/Mo/Year:

The real interest rate on the Deposit at the end of the year was 4.5 %. Quarterly inflation 1.75 %. Find the nominal rate appointed by the Bank.

Answer: _____

299:[7.1859]

/en/Financial calculations/What is more profitable, Internal name: **ZchtovZ** ,

Name:

Var.:**300**. Group: Day/Mo/Year:

Find modern amounts and find out what amount is more profitable: (1) 977 within two years to date or (2) 1107 5 years after today. Annual compound interest rate 1.5%.

Answer: _____

300:[A1 = 1006.53, B1 = 1027.58]

/en/Financial calculations/Annual interest, Internal name: **ZgodprZ** ,

Name:

Var.:**301**. Group: Day/Mo/Year:

The Bank promises 3.5% in 60 days. How much will it be per annum? (In year considered 365 days.)

Answer: _____

301:[23.2784]

21 Game theory.

/en/Game theory/Pure strategy, Internal name: **ZClnGameZ**, search is solved by the minimax and Maximin. Moodle computable

Name:

Var.:**302**. Group: Day/Mo/Year:

Given matrix wins a zero-sum game:

$$\begin{pmatrix} -6 & 9 & -4 & -2 & 6 & -8 & -7 \\ 6 & 7 & -2 & 8 & -4 & 1 & -5 \\ 6 & -2 & -7 & -5 & -6 & -9 & -5 \\ -9 & 6 & 4 & -3 & -5 & 7 & -5 \end{pmatrix}$$

Is there a solution in pure strategies (Yes/no)? If there is, find the price of the game.

Answer:

302: $[-5, (2, 7)]$

/en/Game theory/The expectation of the mixed strategy, Internal name: **ZgameMeZ**, Moodle computable

Name:

Var.:**303**. Group: Day/Mo/Year:

Given a matrix game:

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

What will be the worst expectation of winning from the left player when using a mixed strategy (0.2; 0.8)?

Answer:

303: $[2.2]$

/en/Game theory/Mixed strategy, Internal name: **ZgamethiZ**, 2x3, solved by picture

Name:

Var.:**304**. Group: Day/Mo/Year:

Find the solution to the game in mixed strategies.

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

Answer:

304: $[\frac{-10}{7}, (\frac{1}{7}, \frac{6}{7}), (\frac{3}{7}, 0, \frac{4}{7})]$

/en/Game theory/Dominant strategies, Internal name: **ZDomGameZ**, First remove the dominant, then 2x2 picture

Name:

Var.:**305**. Group: Day/Mo/Year:

Given matrix wins a zero-sum game:

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

To find the optimal strategy and the price of the game.

Answer:

305: [The strategy of the left of the player: $(\frac{5}{8}, \frac{3}{8}, 0)$, Strategy the top player: $(0, \frac{5}{8}, \frac{3}{8})$ price games: $\frac{23}{8}$]

22 Linear programming.

/en/Linear programming/The simplex method is complex, Internal name: **Zsimpl1Z**,

Name:

Var.:**306**. Group: Day/Mo/Year:

Solve the problem of linear programming:

$$L(x) = -2 \cdot x_1 - 2 \cdot x_2 - 11 \cdot x_3 \rightarrow \max$$

$$\begin{cases} x_1 - 1 \cdot x_2 + x_3 = 2 \\ -2 \cdot x_1 + 3 \cdot x_2 \leq 18 \\ -1 \cdot x_1 + 2 \cdot x_2 \geq 2 \\ x_1 \geq 0, x_2 \geq 0, x_3 \geq 0. \end{cases}$$

Answer:

306: $[(6, 4, 0, 18, 0, 0), L(x) = -20]$

/en/Linear programming/Transport problem, Internal name: **ZtransiZ**,

Name:

Var.:**307**. 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:

	$A_1 = 90$	$A_2 = 10$	$A_3 = 70$
$B_1 = 30$	19	13	18
$B_2 = 50$	16	11	20
$B_3 = 90$	12	8	13

Make a transportation plan in which the transport costs are minimal and find these costs.

$$\mathbf{307:} [x_{ij} = \begin{pmatrix} 0 & 0 & 30 \\ 40 & 10 & 0 \\ 50 & 0 & 40 \end{pmatrix}, L = 2410]$$

/en/Linear programming/Dual problem, Internal name: **ZsimpliZ**,

Name:

Var.:**308**. 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.

$$L(x) = 4 \cdot x_1 + 4 \cdot x_2 + 11 \cdot x_3 - 5 \cdot x_4 \rightarrow \min$$

$$\begin{cases} -2x_1 + 2x_2 - 5x_3 + 1x_4 = 15 \\ -1x_1 + 5x_2 + 1x_3 - 3x_4 \geq -17 \\ x_1 \geq 0, x_2 \geq 0, x_4 \geq 0. \end{cases}$$

Answer:

308: $[X = (0, 0, -2, 5), Y = (-2, 1), L = -47]$

/en/Linear programming/The simplex method for a simple 3x3, Internal name: **ZLP33Z** ,

Name:

Var.:**315**. Group: Day/Mo/Year:

Solve the direct and dual linear programming problem.

$$L(x) = 2 \cdot x_1 + 37 \cdot x_2 + 17 \cdot x_3 \rightarrow \max$$

$$\begin{cases} x_1 + 2 \cdot x_2 + x_3 \leq 14 \\ 3 \cdot x_1 + 9 \cdot x_2 + 4 \cdot x_3 \leq 60 \\ x_1 + 4 \cdot x_2 + 6 \cdot x_3 \leq 58 \\ x_i \geq 0. \end{cases}$$

Answer:

$$\mathbf{315:} [x_1 = 0; x_2 = 4; x_3 = 6; t_1 = 5; t_2 = 3; t_3 = 0; \max = 250]$$

/en/Linear programming/The simplex method is a simple 3x5, Internal name: **ZLP35Z** ,

Name:

Var.:**318**. Group: Day/Mo/Year:

Solve the direct and dual linear programming problem.

$$L(x) = 23 \cdot x_1 + 2 \cdot x_2 + 10 \cdot x_3 + 9 \cdot x_4 + 2 \cdot x_5 \rightarrow \max$$

$$\begin{cases} 2 \cdot x_1 + 2 \cdot x_2 + 2 \cdot x_3 + x_4 + 3 \cdot x_5 \leq 14 \\ x_1 + 2 \cdot x_2 + 3 \cdot x_3 + 3 \cdot x_4 + 3 \cdot x_5 \leq 27 \\ 3 \cdot x_1 + 3 \cdot x_2 + 2 \cdot x_3 + x_4 + 2 \cdot x_5 \leq 18 \\ x_i \geq 0. \end{cases}$$

Answer:

$$\mathbf{318:} [x_1 = 4; x_2 = 0; x_3 = 0; x_4 = 6; x_5 = 0; t_1 = 4; t_2 = 0; t_3 = 5; \max = 146]$$

/en/Linear programming/The simplex method is a simple 4x4, Internal name: **ZLP44Z** ,

Name:

Var.:**316**. Group: Day/Mo/Year:

Solve the direct and dual linear programming problem.

$$L(x) = 19 \cdot x_1 + 4 \cdot x_2 + 7 \cdot x_3 + 9 \cdot x_4 \rightarrow \max$$

$$\begin{cases} 2 \cdot x_1 + x_2 + 3 \cdot x_3 + x_4 \leq 12 \\ 2 \cdot x_1 + 3 \cdot x_2 + x_3 + 5 \cdot x_4 \leq 40 \\ x_1 + 3 \cdot x_2 + 3 \cdot x_3 + x_4 \leq 14 \\ 11 \cdot x_1 + 3 \cdot x_2 + 2 \cdot x_3 + 5 \cdot x_4 \leq 63 \\ x_i \geq 0. \end{cases}$$

Answer:

$$\mathbf{316:} [x_1 = 3; x_2 = 0; x_3 = 0; x_4 = 6; t_1 = 4; t_2 = 0; t_3 = 0; t_4 = 1; \max = 111]$$

/en/Linear programming/The simplex method is a simple 5x5, Internal name: **ZLP55Z** ,

Name:

Var.:**317**. Group: Day/Mo/Year:

Solve the direct and dual linear programming problem.

$$L(x) = 27 \cdot x_1 + 3 \cdot x_2 + 9 \cdot x_3 + 12 \cdot x_4 + 32 \cdot x_5 \rightarrow \max$$

$$\begin{cases} 2 \cdot x_1 + x_2 + x_3 + x_4 + 2 \cdot x_5 \leq 22 \\ 2 \cdot x_1 + x_2 + 3 \cdot x_3 + 2 \cdot x_4 + x_5 \leq 24 \\ 3 \cdot x_1 + 3 \cdot x_2 + x_3 + x_4 + 3 \cdot x_5 \leq 30 \\ 2 \cdot x_1 + 3 \cdot x_2 + 3 \cdot x_3 + x_4 + 3 \cdot x_5 \leq 28 \\ x_1 + 3 \cdot x_2 + x_3 + 3 \cdot x_4 + 3 \cdot x_5 \leq 42 \\ x_i \geq 0. \end{cases}$$

Answer:

$$\mathbf{317:} [x_1 = 2; x_2 = 0; x_3 = 0; x_4 = 6; x_5 = 6; t_1 = 4; t_2 = 0; t_3 = 3; t_4 = 5; t_5 = 0; \max = 318]$$

23 Economic and mathematical methods.

/en/Economic and mathematical methods/Demand point, Internal name: **ZeconomZ**,

Name:

Var.:**319**. Group: Day/Mo/Year:

nothing

Answer: _____

319: [(3, 2, 6)]

/en/Economic and mathematical methods/Suppliers and traders, Internal name: **ZmekoniZ**,

Name:

Var.:**320**. Group: Day/Mo/Year:

Suppliers and traders decided to unite in one company. The company's income is set by the function $Y = 3575 \cdot x_1^{3/11} \cdot x_2^{7/11}$, where x_1 — number of sellers, x_2 — number of suppliers. Salary seller 325, supplier — 2275. Find the optimal composition of the company, maximizing profits.

Answer: _____

320: [$x_1 = 81, x_2 = 27, W = 8775$]

/en/Economic and mathematical methods/Street vendor, Internal name: **ZmekoniiZ**,

Name:

Var.:**321**. Group: Day/Mo/Year:

A street vendor buys goods at a price of 3 per piece. Sales of y is associated with assign them a price of v by the formula $y = 1200 - 80 \cdot v$. 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: _____

321: [$y = 480, v = 9$]

/en/Economic and mathematical methods/Price and costs, Internal name: **ZmekoniiiiZ**,

Name:

Var.:**322**. Group: Day/Mo/Year:

The price of v of the company's products is associated with the sales volume y dependence $v(y) = 66 - 1 \cdot y$, the cost of production $I(y) = 1 \cdot y^3 + (-22) \cdot y^2 + (102) \cdot y + (0)$. Find the optimal volume of sales, the price of goods, income and costs at maximum profit.

Answer: _____

322: [$y = 4, v = 62, I = 120, W = 128$]

/en/Economic and mathematical methods/Cross-sectoral balance (simple), Internal name: **ZleonteviZ**,

Name:

Var.:**323**. Group: Day/Mo/Year:

On the island of Chunga-Chang in the production of 1 ton of coconuts natives eat 400 kg. coconuts and 600 kg. bananas. In the production of 1 ton. bananas they eat 100 kg. coconuts and 700 kg. bananas.

You need to create a matrix of direct costs and find the matrix of total material costs:

$$\left(\begin{array}{cc} & \\ & \end{array} \right) \left(\begin{array}{cc} & \\ & \end{array} \right)$$

Find out what the harvest of coconuts () and bananas.() need to plan for export from Chung-Chang 40 t. coconuts and 30 t. bananas.

323: [$\begin{pmatrix} 0.4 & 0.1 \\ 0.6 & 0.7 \end{pmatrix}$ — direct cost matrix, $\begin{pmatrix} 2.5 & 0.83 \\ 5 & 5 \end{pmatrix}$ — full cost matrix, 125 T. coconuts and 350 T. bananas.]

/en/Economic and mathematical methods/Interindustry balance, Internal name: **ZobmenZ**,

Name:

Var.:**324**. 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.

$$Y = \begin{pmatrix} 100 \\ 200 \\ 400 \end{pmatrix}, A = \begin{pmatrix} 0.3 & 0.1 & 0.2 \\ 0.3 & 0.1 & 0.2 \\ 0.1 & 0.3 & 0.1 \end{pmatrix}$$

Answer: _____

$$\mathbf{324:} [X = \begin{pmatrix} 402.174 \\ 502.174 \\ 656.522 \end{pmatrix}, Z = \begin{pmatrix} 120.652 & 50.2174 & 131.304 \\ 120.652 & 50.2174 & 131.304 \\ 40.2174 & 150.652 & 65.6522 \end{pmatrix}]$$

/en/Economic and mathematical methods/Budget set, Internal name: **ZbudgetZ**,

Name:

Var.:**325**. Group: Day/Mo/Year:

Nothing

Answer: _____

325: [(16, 8)]

/en/Economic and mathematical methods/Price supply and demand, Internal name: ZcsprZ ,

Name:

Var.:**326**. Group: Day/Mo/Year:

Given the dependence of demand on price: $D(p) = 496 - 8 \cdot p$ and the dependence of supply on price: $S(p) = 119 + 5 \cdot p$. 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 ().

326: [Equilibrium price:29

Revenues at the Equilibrium price: 7656

is stable.

Price at maximum revenue:31

Maximum revenue:7688]

/en/Economic and mathematical methods/Selling stuff, Internal name: ZshtuchkiZ ,

Name:

Var.:**327**. Group: Day/Mo/Year:

Someone decided to buy "things" in bulk at 50 and resell to students. He did two surveys to study demand. In the first 9 students from 17 has agreed to buy the thing for 80. At the second 7 from 17 agreed to buy for 130. The city is home to 7000 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:).

327: [Demand function: $y = -16.48x + 5024.4$, price: 177.4, quantity 2101, revenue: 267667]

/en/Economic and mathematical methods/Sly selling stuff, Internal name: ZshtuchkiZ ,

Name:

Var.:**328**. Group: Day/Mo/Year:

Someone decided to buy "things" in bulk at 70 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 7 students from 13 agreed to buy a "thing" for 110, On the second survey 3 of 13 agreed to buy for 150. In University come 2000 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:).

328: [Demand function: $y = -15.375x + 2768.25$, the price in the morning: 143.4, price in the evening: 106.7, the quantity: 1128, income: 62067.5]

24 (not checked) Test tasks.

/en/(not checked) Test tasks/Convergence of series, Internal name: ZintshZ ,

Name:

Var.:**329**. Group: Day/Mo/Year:

Find the interval of convergence of the series:

$$\sum_{n=1}^{n=\infty} \frac{(5 \cdot x - 1)^n \cdot (3 \cdot n^8 - 9)}{(6)^n \cdot (9 \cdot n^{8.9} - 7 \cdot n)}$$

329: [$[-1; \frac{7}{5}]$]

25 ANSWERS.

/en/ANSWERS/All the Answers, Internal name: ,

Name:

Var.:**330**. Group: Day/Mo/Year:

330:

/en/ANSWERS/RESPONSE TO REQUEST, Internal name: ,

Name:

Var.:**331**. Group: Day/Mo/Year:

331:

26 Sample.

/en/Sample/Sample all tasks, Internal name:

Name:

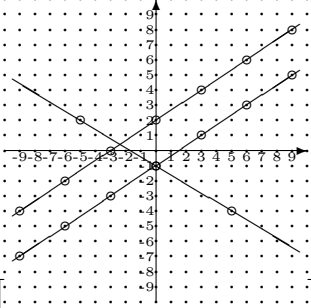
Var.:332. Group:

Day/Mo/Year:

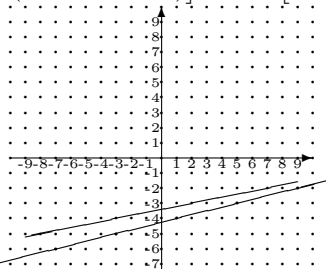
332:

06/08/2020 18:43:22

- 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: $[\dots]$



- 45: $[\dots]$, $y = \frac{1}{4} \cdot x + \frac{-17}{4}$, $(17, 0)$
 46: $[(7, 16), (-7, 14), (2, 8)]$ 47: $[(-1, -1)]$ 48: $[(13, 4), (6, 5), (7, 12) \text{ or } (20, 3), (21, 10)]$ 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: $[\text{For ABCD: } (-9, -4), \text{ For ABDC: } (-3, 6)]$ 59: $[\text{For ABCD: } (8, -4, -12), \text{ For ABDC: } (-2, -2, -6)]$ 60: $[(88; 3), (43; 50) \text{ and } (-6; -87), (-51; -40)]$ 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: $[\text{Formula to verify the solution: } (1 - 3x_3, -2x_3, x_3)]$ 79: $[\text{Formula to verify the solution: } (1 - 3x_4, -2x_4, -1x_4, x_4)]$ 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: $[\frac{4}{3}; k = 2, -4; k = 1]$ 97: $[-3 \cdot x^2 - 8 \cdot x - 3]$
 98: $[9 \cdot x^2 - 8]$ 99: $[-2 \cdot s_1 s_2^2 + 2 \cdot s_1^2 s_3 - 5 \cdot s_2 s_3]$
 100: $[12 \pm 6 \cdot i, -3 \pm 6 \cdot i, x^2 - 24 \cdot x + 180, x^2 + 6 \cdot x + 45]$
 101: $[\begin{pmatrix} 12 & -8 \\ 14 & -9 \end{pmatrix}]$ 102: $[\begin{pmatrix} -6 & 0 & -3 \\ 6 & -4 & 9 \\ -11 & 5 & -13 \end{pmatrix}]$
 103: $[A_{32} = -10, A_{11} = 8]$ 104: $[-1]$ 105: $[5]$
 106: $[-4]$ 107: $[\begin{pmatrix} 31 & 13 \\ 19 & 8 \end{pmatrix};]$ 108: $[\begin{pmatrix} 1 & -1 & -2 \\ 1 & 0 & -1 \\ 0 & 0 & 1 \end{pmatrix};]$
 109: $[\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & -1 & 1 & -1 \\ -1 & 1 & 0 & 1 \end{pmatrix}]$ 110: $[\begin{pmatrix} 1 & 1 & 0 & 0 & 0 \\ -1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 0 \\ -1 & 0 & 0 & 1 & 0 \\ -1 & 0 & 1 & 1 & 1 \end{pmatrix}]$
 111: $[A^{-1} = \begin{pmatrix} 2 & 1 \\ 1 & 1 \end{pmatrix}, X = \begin{pmatrix} 2 & 1 \\ 0 & 3 \end{pmatrix}, Y = \begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}]$
 112: $[A^{-1} = \begin{pmatrix} 0 & -1 \\ -1 & 1 \end{pmatrix}, X = \begin{pmatrix} 2 & 1 \\ 2 & 1 \end{pmatrix}]$
 113: $[A^{-1} = \begin{pmatrix} -1 & 0 & 0 \\ 0 & 0 & -1 \\ 1 & 1 & 1 \end{pmatrix}, X = \begin{pmatrix} 0 & 1 & 1 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}]$
 114: $[A^{-1} = \begin{pmatrix} -1 & 0 & 0 & 0 \\ 1 & 0 & -1 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \end{pmatrix}, X = \begin{pmatrix} 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 1 \end{pmatrix}]$
 115: $[A^{-1} = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ -1 & 2 & 1 & -1 & 1 \\ -1 & 0 & 1 & 0 & 0 \\ 1 & 0 & -1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 \end{pmatrix}, X = \begin{pmatrix} 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 \end{pmatrix}]$
 116: $[A^{-1} = \begin{pmatrix} -1 & 0 & 0 & 0 & -1 & 1 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & -1 & 0 & 0 \\ 1 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & -1 & 1 \end{pmatrix}, X = \begin{pmatrix} 1 & 1 & 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 1 & 1 \end{pmatrix}]$ 117: $[(2x_3 - 2x_4, -2x_3 + 1x_4, x_3, x_4)]$ 118: $[(-2x_3 + 2x_4, 2x_3 + 2x_4, x_3, x_4)]$
 119: $[\frac{1}{41} \begin{pmatrix} -9 & 40 \\ 40 & 9 \end{pmatrix}]$ 120: $[\begin{pmatrix} 1 & 0 & -2 & 0 & 1 \\ 0 & 1 & 2 & 0 & 1 \\ 0 & 0 & 0 & 1 & -1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}]$
 121: $[\begin{pmatrix} 1 & -2 \\ 4 & 7 \end{pmatrix}]$ 122: $[\begin{pmatrix} -3 & 2 \\ -12 & 7 \end{pmatrix}]$
 123: $[\begin{pmatrix} -1 & -4 & -4 \\ 2 & 5 & 2 \\ 0 & 0 & 3 \end{pmatrix}]$ 124: $[\begin{pmatrix} 4 & 1 & 2 \\ 0 & 3 & 0 \\ -1 & -1 & 1 \end{pmatrix}]$
 125: $[1 \cdot x^2 + 4 \cdot y^2, \begin{pmatrix} 3 & -2 \\ 2 & 3 \end{pmatrix} / \sqrt{13}]$ 126: $[\begin{pmatrix} 18 \\ 9 \end{pmatrix}, \begin{pmatrix} 1 \\ 3 \end{pmatrix}]$ 127: $[A = \begin{pmatrix} 4 & -5 \\ -3 & 3 \end{pmatrix}, B = \begin{pmatrix} -1 & -\frac{5}{3} \\ -1 & \frac{3}{4} \end{pmatrix}]$

abcababacbbb. 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: bbababcbbbbbcb. 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: [2] **211**: [2] **212**: $\left[\begin{array}{c|cccc} & 1 & 2 & 3 & 4 \\ a & 4 & 4 & 2 & 4 \\ b & 4 & 3 & 1 & 4 \end{array} \right]$, In: 2,

Out: 1.] **213**: $\left[\begin{array}{c|ccc} & 1 & 2 & 3 \\ a & 2 & 3 & 3 \\ b & 3 & 1 & 3 \end{array} \right]$, In: 2, Out: 1.]

214: $\left[\begin{array}{c|cccc} & 1 & 2 & 3 & 4 \\ a & 1 & 4 & 1 & 3 \\ b & 1 & 3 & 1 & 1 \end{array} \right]$, In: 2, Out: 2, 3, 4.]

215: $\left[\begin{array}{c|ccccc} & 1 & 2 & 3 & 4 & 5 \\ a & 1 & 4 & 1 & 3 & 1 \\ b & 1 & 1 & 1 & 5 & 3 \end{array} \right]$, In: 2, Out: 2, 3, 4.]

216: $\left[\begin{array}{c|cccccc} & 1 & 2 & 3 & 4 & 5 & 6 \\ a & 2 & 5 & 1 & 4 & 5 & 3 \\ b & 2 & 5 & 1 & 5 & 5 & 4 \end{array} \right]$, In: 6, Out: 2, 4, 6.]

217: $\left[\begin{array}{c|ccccccc} & 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ a & 2 & 4 & 3 & 6 & 5 & 5 & 1 \\ b & 1 & 2 & 5 & 4 & 5 & 5 & 3 \end{array} \right]$, In: 7, Out: 1, 3, 6.]

218: $\left[\begin{array}{c|cccc} & (1) & (24) & (36) & (5) \\ a & (24) & (36) & (36) & (24) \\ b & (5) & (36) & (36) & (36) \end{array} \right]$, In: (1), Out: (24), (5).

] **219**: $\left[\begin{array}{c|cccccc} & (1) & (24) & (36) & (58) & (79) \\ a & (24) & (58) & (36) & (36) & (58) \\ b & (24) & (79) & (36) & (36) & (58) \end{array} \right]$, In: (1), Out:

(24), (58), (79).] **220**: [FIRST: cd, a, d, c, acd, b, Tree: (S (A d (S (A d (S ac)) (B bb))) (B bb)).] **221**: [(0 1 1 1, 1 1 0 1, 1 0 0 1)] **222**: [(0 1 0 1 1, 1 0 1 1 1, 0 1 1 1 0)]

223: [(1 1 0 1 0 0 1 0, 1 0 1 1 1 0 1 1, 0 1 0 0 0 1 1 0)] **224**: [(0 0 1 0), (1 1 1 1), (1 0 1 1)] **225**: [(1x₃, 0x₃ + 1x₄, x₃, x₄)] **226**: [19/1309] **227**: [293/15168683] **228**: [x = 390]

229: [x = 26] **230**: [x = 64] **231**: [b=523; Key=7782 7656 7404 9515 3214 1135 ; Crypt=12005; Mess=101001;] **232**: [b=8913; Key=9781 9562 4776 5204 6060 5598 ; Crypt=19761; Mess=010011;] **233**: [(3; 9) → (48), (4; 8) → (34)] **234**: [(17; 44) → (1342), (19; 15) → (2139)]

235: [423] **236**: [48] **237**: [179] **238**: [Message: 24, public key: 7 Crypt: (18, 19).] **239**: [(21, 21).]

240: [y = 9 - 9 · (x - 2) + 3 · (x - 2)² - 42 · (x - 2)³ + 21 · (x - 2)⁴] **241**: [y = 8x + 3] **242**: [1x³y⁵ + 1y⁴ = c, y²]

243: [y = 8(x + 3)ln(x + 3) + C(x + 3) + 31] **244**: [C₁ · e^{-2x} + C₃ · e^{2x}] **245**: [C₁ · e^{-3x} + C₂ · x · e^{-3x} + C₃ · e^{5x}] **246**: [C₁ · e^{3x} + C₂ · x · e^{3x} + (5 · x² - 4 · x)] **247**: [C₁ · e^{-3x} + C₂ · e^{-2x} + (3 · e^{-1x} + 1 · cos(-4x) + 2 · sin(-4x))]

248: [C₁ · e^{3x} + C₂ · e^{2x} + (-5 · x - 3 + 1 · x · e^{2x})] **249**: [C₁ · e^{6x} + C₂ + (-2 · x³ + 3 · x² - 4 · x)] **250**: [y = √(3 · x² + 22 · x¹⁴)]

251: [y + C₁/y² = 3x + C₂] **252**: [y⁶ = C · e^{-30x} + 6/29 · e^{-1x}] **253**: [3] **254**: [y = 33/(C · x⁻³⁰ - 5 · x³) + 6 · x⁻³] **255**: [3]

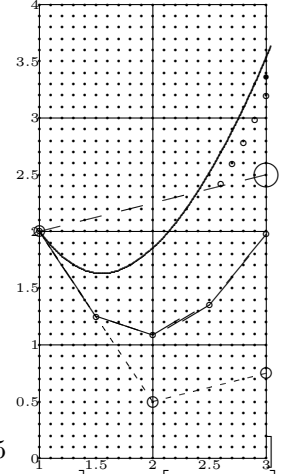
256: $\left\{ \begin{array}{l} x = (C + \frac{27}{10} \cdot \ln |p + \frac{-3}{10}|) \cdot p^{-2}, \\ y = (2 + \frac{-10}{3} \cdot p) \cdot (C + \frac{27}{10} \cdot \ln |p + \frac{-3}{10}|) \cdot p^{-1} + 9 \cdot \ln |p|. \end{array} \right.$]

257: [4] **258**: [2] **259**: [√10] **260**: [6] **261**: [12] **262**: $\left[\begin{array}{c} y_1 \\ y_2 \end{array} \right] = C_1 \cdot e^{9 \cdot x} \cdot \begin{pmatrix} 1 \\ 2 \end{pmatrix} + C_2 \cdot e^{8 \cdot x} \cdot \begin{pmatrix} -2 \\ -3 \end{pmatrix}$

263: [2] **264**: $\left[\begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = C_1 \cdot e^{3 \cdot x} \cdot \begin{pmatrix} 2 \\ 3 \end{pmatrix} + C_2 \cdot e^{2 \cdot x} \cdot \begin{pmatrix} -1 \\ -2 \end{pmatrix} + x \cdot \begin{pmatrix} 0 \\ -3 \end{pmatrix} + \begin{pmatrix} -1 \\ 2 \end{pmatrix} \right]$ **265**: [4] **266**: [lim = -3;

y = -3 · x⁻² + 3 · x⁻¹ + 3 · x⁻¹ · ln x] **267**: [1] **268**: [4, y = -4 · e^{-4x} + 5 · e^{-6x} + 2 · cos(3x) - 1 · sin(3x)]

269: [3] **270**: [y = 3.5 · x · ln x - 5 · x + 7, y(3) = 3.535, sh = 1 → 0.75, sh = 0.5 → 1.975, sh = 0.1 → 3.1932,



sh = 0.05 → 3.36237, prs → 2.5] **271**: [1: 38/75 = 0.506667, 2 : 10/19 = 0.526316] **272**: [0.980338]

273: [5/70 = 1/14 = 0.071] **274**: [84] **275**: [0.646; 0.164] **276**: [M = 5, D = 7] **277**: [0.223] **278**: [282]

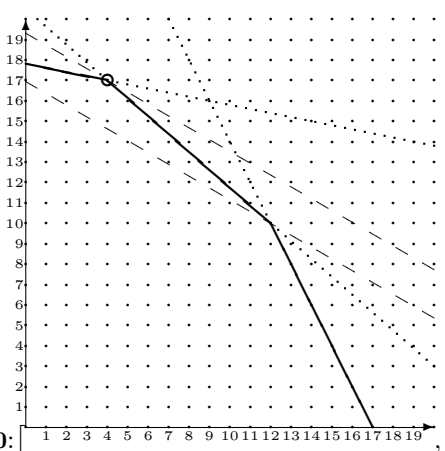
279: [0.450138, 0.549862] **280**: [(8.92904; 9.04207)] **281**: [5.048; 0.358329; (4.73663; 5.35937)] **282**: [6] **283**: [1/8 ≈ 0.125] **284**: [86/21 ≈ 4.095] **285**: [Σ = 36, ae, bf, cd] **286**: [Σ = 56, af, bg, ce, dh] **287**: [Σ = 94, af, bj, ci, dh, eg] **288**: [Σ = 136, ag, bi, ck, dj, eh, fl] **289**: [Σ = 155, aj, bi, cn, dk, el, fm, gh] **290**: [] **291**: [15593.2]

292: [14842.1] **293**: [2296.41] **294**: [791.909] **295**: [14.8955] **296**: [2.53365] **297**: [5.28572] **298**: [2.46545] **299**: [7.1859]

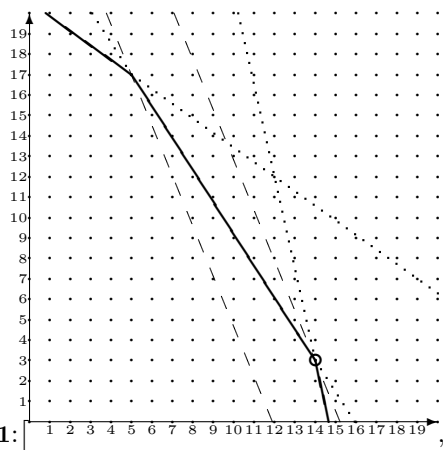
300: [A1 = 1006.53, B1 = 1027.58] **301**: [23.2784] **302**: [-5, (2, 7)] **303**: [2.2] **304**: [(-10/7, (1/7, 6/7), (3/7, 0, 4/7)] **305**: [The strategy of the left of the player: (5/8, 3/8, 0), Strategy the top player: (0, 5/8, 3/8) price games: 23/8] **306**: [(6, 4, 0, 18, 0, 0),

L(x) = -20] **307**: [x_{ij} = $\begin{pmatrix} 0 & 0 & 30 \\ 40 & 10 & 0 \\ 50 & 0 & 40 \end{pmatrix}$, L = 2410]

308: [X = (0, 0, -2, 5), Y = (-2, 1), L = -47] **309**: [(5, 2),



21, 2 - 6] 310: [A - 4, B - 17, Profit - 1101.]



- 311:** $x_i = (14; 3), L(x) = L(y) = 487, y_i = (1; 0; 2)$
- 312:** $[t_1 = 1; t_2 = 5; t_3 = 0; \max = \min = 102]$
- 313:** $[t_1 = 0; t_2 = 5; t_3 = 1; t_4 = 0; \max = \min = 109]$
- 314:** $[x_1 = 6; x_2 = 0; t_1 = 3; t_2 = 0; \max = 18]$
- 315:** $[x_1 = 0; x_2 = 4; x_3 = 6; t_1 = 5; t_2 = 3; t_3 = 0; \max = 250]$
- 316:** $[x_1 = 3; x_2 = 0; x_3 = 0; x_4 = 6; t_1 = 4; t_2 = 0; t_3 = 0; t_4 = 1; \max = 111]$
- 317:** $[x_1 = 2; x_2 = 0; x_3 = 0; x_4 = 6; x_5 = 6; t_1 = 4; t_2 = 0; t_3 = 3; t_4 = 5; t_5 = 0; \max = 318]$
- 318:** $[x_1 = 4; x_2 = 0; x_3 = 0; x_4 = 6; x_5 = 0; t_1 = 4; t_2 = 0; t_3 = 5; \max = 146]$
- 319:** $[(3, 2, 6)]$
- 320:** $[x_1 = 81, x_2 = 27, W = 8775]$
- 321:** $[y = 480, v = 9]$
- 322:** $[y = 4, v = 62, I = 120, W = 128]$
- 323:** $\left[\begin{pmatrix} 0.4 & 0.1 \\ 0.6 & 0.7 \end{pmatrix} \right]$ — direct cost matrix, $\begin{pmatrix} 2.5 & 0.83 \\ 5 & 5 \end{pmatrix}$ — full cost matrix, 125 T. coconuts and 350 T. bananas.]
- 324:** $[X = \begin{pmatrix} 402.174 \\ 502.174 \\ 656.522 \end{pmatrix},$
- $Z = \begin{pmatrix} 120.652 & 50.2174 & 131.304 \\ 120.652 & 50.2174 & 131.304 \\ 40.2174 & 150.652 & 65.6522 \end{pmatrix}]$
- 325:** $[(16, 8)]$
- 326:** [Equilibrium price:29
Revenues at the Equilibrium price: 7656
is stable.
Price at maximum revenue:31
Maximum revenue:7688]
- 327:** [Demand function: $y = -16.48x + 5024.4$, price: 177.4, quantity 2101, revenue: 267667]
- 328:** [Demand function: $y = -15.375x + 2768.25$, the price in the morning: 143.4, price in the evening: 106.7, the quantity: 1128, income: 62067.5]
- 329:** $[-1; \frac{7}{5}]$
- 330: 331: 332:**