

Общее решение линейной неоднородной системы д.у. примет окончательный вид

$$x = C_1 e^t + C_2 e^{4t} - \cos t,$$

$$y = -\frac{1}{2} C_1 e^t + C_2 e^{4t} + \frac{1}{2} \cos t + \frac{1}{2} \sin t.$$

Приведенный метод используется при решении примеров N 18 настоящих методических указаний.

Литература

по РГР 3.1, которую можно приобрести на кафедре высшей математики.

1. Шамсутдинова И.Г., Зироян М.А., Пашкова Т.В. Дифференциальные уравнения. Часть 1.
2. Шамсутдинова И.Г., Зироян М.А., Пашкова Т.В. Дифференциальные уравнения. Часть 2.
3. Ярский А.С. Применение дифференциальных уравнений к решению инженерно-технических задач.
4. Студентам для подготовки к аттестации по курсу высшей математики. 3-й семестр. С использованием опыта тестирования зарубежных и отечественных вузов.

Расчетно-графическая работа N 3.1 Дифференциальные уравнения

1. Найти решение дифференциального уравнения с начальным условием.

1. $y' = e^{x+y}$, $y(0) = 0$.
2. $y' = \frac{1}{\cos^2 x}$, $y(0) = 2$.
3. $y' = \frac{1}{1 + \sqrt{x}}$, $y(0) = 1$.
4. $y' = y^2 + 1$, $y(0) = 1$.
5. $y' = x \cos x$, $y(0) = 4$.
6. $yy' = \sqrt{1+y^2}$, $y(0) = \sqrt{3}$.
7. $y' = \frac{1}{2\sqrt{x-1}}$, $y(5) = 0$.
8. $y' = \sin y$, $y(2) = \frac{\pi}{2}$.
9. $y' = \frac{1}{\sqrt{1-x^2}}$, $y(0) = 1,5$.
10. $y' = 4y^2$, $y(0) = 1$.
11. $y' = \frac{1}{x^2 - 1}$, $y(2) = 0$.
12. $y' = y \cdot \ln y$, $y(1) = 2$.
13. $yy' = y + 1$, $y(2) = 0$.
14. $y' = \sin^2 x$, $y(\frac{\pi}{2}) = 1$.
15. $y' = \sqrt{y+3}$, $y(0) = 1$.
16. $y' = \ln x$, $y(1) = -3$.
17. $y' = \frac{\sin x}{x}$, $y(\frac{\pi}{2}) = -1$.
18. $y' = y^2 + y$, $y(0) = 2$.
19. $y' = \operatorname{sh} x$, $y(0) = 3$.
20. $y' = y\sqrt{y}$, $y(0) = 4$.
21. $y' = 2xe^{-x^2}$, $y(0) = 1$.
22. $y' = \frac{\ln x}{x} + 1$, $y(1) = -1,5$.
23. $y' = \frac{y^2 + 1}{y^2}$, $y(0) = 1$.
24. $y' = y^2 + 2y + 5$, $y(1) = 1$.
25. $y' = \sqrt{x+9}$, $y(0) = 0$.
26. $y' = \frac{-x}{y}$, $y(1) = 2$.
27. $y' = \operatorname{arctg} x$, $y(0) = 1$.
28. $y' = \frac{-y}{x}$, $y(1) = 3$.
29. $y' = \frac{1+y^2}{1+x^2}$, $y(0) = 1$.
30. $y' = \frac{y}{1-x^2}$, $y(0) = -2$.

2. Найти общее решение уравнения.

1. $x^2 y' y' + 1 = y$.
2. $x \cdot \sqrt{1-y^2} dx + y \cdot \sqrt{1-x^2} dy = 0$.
3. $xy dx + (x+1) dy = 0$.
4. $(xy^2 + x) dx + (y - x^2 y) dy = 0$.
5. $dx - x\sqrt{1-x^2} dy = 0$.
6. $\sin x \cdot \sin y \cdot dx + \cos x \cdot \cos y \cdot dy = 0$.
7. $(1+y^2) dx = xy dy$.
8. $(1+y^2)(e^{2x} dx - e^y dy) - (1+y) dy = 0$.
9. $dy - e^{x-y} dx = 0$.
10. $x + xy + yy'(1+x) = 0$.
11. $e^{-y}(1+y) = 1$.
12. $(y^2 + xy^2) dx + (x^2 - yx^2) dy = 0$.
13. $x^3 y' + y = 0$.
14. $y^2 y' + 2x - 1 = 0$.
15. $\sqrt{1+y^2} dx - xy dy = 0$.
16. $y' \operatorname{tg} x - y = 3$.
17. $(x^2 - 1)y' + 2xy^2 = 0$.
18. $\sin y \cos x dx = \cos y \sin x dy$.
19. $2x\sqrt{1-y^2} dx + y dy = 0$.
20. $\sqrt{1-y^2} dx + y\sqrt{1-x^2} dy = 0$.

21. $2x^2 y y' = 2 - y^2$.
23. $x y' + y = y^2$.
24. $(1 + x) dy + (1 - y) dx = xy$.
25. $y' = 2\sqrt{y} \ln x$.
26. $x^2 y' - \cos 2y = 1$.
27. $(1 + y^2) dx = x^3 y dy$.
28. $y y' - e^{x+y} = 0$.
29. $x^2 y' \cos y + 1 = 0$.
30. $x^3 y' - \cos y = 1$.

3. Найдите общее решение дифференциального уравнения.

1. $x y' = y - x e^{y/x}$.
2. $x^2 y' + y^2 + 13xy + 49x^2 = 0$.
3. $(y + \sqrt{xy}) dx = x dy$.
4. $(x - y) dx + (x + y) dy = 0$.
5. $x y' = x e^{y/x} + y$.
6. $x y' - y = (x + y) \ln \frac{x + y}{x}$.
7. $2x^2 y' = 5xy - 4x^2 - y^2$.
8. $x^2 y' = 5xy - 4x^2 - y^2$.
9. $(x^2 + y^2)' = 2xy$.
10. $x^2 y' = 17xy - 64x^2 - y^2$.
11. $(y^2 - 2xy) dx + x^2 dy = 0$.
12. $x^2 y' + y^2 + 11xy + 36x^2 = 0$.
13. $x y' = y + x e^{-y/x}$.
14. $x y' = 3y - 2x - 2\sqrt{xy - x^2}$.
15. $2xy y' + x^2 = y^2$.
16. $x dy = y(\ln y - \ln x) dx$.
17. $2xy y' + x^2 = y^2$.
18. $y' = \frac{x^2 + xy + y^2}{x^2}$.
19. $x y' = \sqrt{x^2 - y^2} + y$.
20. $x^2 y' = 6x^2 + 6xy + y^2$.
21. $x^2 y' = 9x^2 - 5xy + y^2$.
22. $(x - y) dx + (2y - x) dy = 0$.
23. $x dy = (x + y) dx$.
24. $(5y - 3x) dx - (5x + 3y) dy = 0$.
25. $y' = \frac{x + 2y}{x + y}$.
26. $x^2 y' = 13xy - 36x^2 - y^2$.
27. $x^2 y' = y^2 - 7xy + 16x^2$.
28. $x^2 + 2xy - y^2 + (y^2 + 2xy - x^2) y' = 0$.
29. $y' = \frac{x + y}{x - y}$.
30. $(y^2 + 2xy - x^2) dy = (y^2 - 2xy - x^2) dx$.

4. Найдите общее решение дифференциального уравнения.

1. $x y' = 3y - x$.
2. $y' = \frac{3}{x} y + \frac{2}{x^3}$.
3. $y' = y + e^{3x}$.
4. $y' - \frac{y}{\operatorname{tg} x} = \frac{\sin x}{\sqrt{4 - x^2}}$.
5. $x y' + x^3 - y = 0$.
6. $y' - y = \frac{2}{x}$.
7. $x y' = x^4 + 2y$.
8. $x y' - 2y = x^3 \operatorname{tg} x$.
9. $(x y' - 1) \ln x = 2y$.
10. $y' - 2xy = x$.
11. $y' - y \operatorname{th} x = \frac{1}{\operatorname{ch} x}$.
12. $x y' + y - e^x = 0$.
13. $x y' = y + x^2 \operatorname{ch} x$.
14. $y' + \frac{y}{x} = -\frac{12}{x^3}$.
15. $x y' = x + y$.
16. $y' + y = e^{2x}$.
17. $2xy' = 2x + y$.
18. $x(y' - y) = e^x$.

19. $y' + y = \cos x$.
20. $y' = 3x - \frac{y}{x}$.
21. $y' + y \operatorname{tg} x = \frac{\cos x}{\sqrt{x^2 + 5}}$.
22. $x y' - 4y = \frac{x^4}{\sqrt{\ln x}}$.
23. $y' + \frac{1 - 2x}{x^2} y = 1$.
24. $x y' - 5y = \frac{x^2 + 2}{x^2}$.
25. $x y' + y - \ln x = 0$.
26. $y' + y \operatorname{tg} x = \cos^2 x$.
27. $x y' + x^3 + y = 0$.
28. $y' - y = x^2$.
29. $x y' + y = \frac{1}{\operatorname{tg}^2 x}$.
30. $x \ln x y' - y = \frac{x(\ln x)^2}{x^2 - 3}$.

5. Найдите частное решение уравнения в дифференциалах.

1. $x(2 + 3xy) dx + (x^3 - 3y^2) dy = 0, y(0) = 1$.
2. $2xy dx + (x^2 - y^2) dy = 0, y(0) = -1$.
3. $x(2 - 9xy^2) dx - y(6x^3 - 4y^2) dy = 0, y(0) = 1$.
4. $e^{-y} dx - (x e^{-y} + 2y) dy = 0, y(0) = -1$.
5. $\frac{y}{x} dx + (y^3 + \ln x) dy = 0, y(1) = 1$.
6. $2x(1 + \sqrt{x^2 - y}) dx - \sqrt{x^2 - y} dy = 0, y(0) = -1$.
7. $x(2x^3 - y^2) dx - y(x^2 - 2y^2) dy = 0, y(0) = -1$.
8. $e^x dx + (x e^y - 2y) dy = 0, y(0) = -1$.
9. $y x^{y-1} dx + x^y \ln x dy = 0, y(e) = 1$.
10. $(x\sqrt{x^2 + y^2} + 1) dx + y(\sqrt{x^2 + y^2} - 1) dy = 0, y(0) = -1$.
11. $x(2x^2 + y^2) dx + y(x^2 + 2y^2) dy = 0, y(0) = -1$.
12. $3x(x + 2y^2) dx + 2y(3x^2 + 2y^2) dy = 0, y(0) = 1$.
13. $(3x^2 - 2x - y) dx + (2y - x + 3y^2) dy = 0, y(0) = -1$.
14. $\frac{y^2}{3x^2} dx - \frac{y^2}{2x^3} dy = 0, y(0) = 1$.
15. $(\frac{y}{x^2} + y^2 - 1) dx - \frac{x}{x^2 + y^2} dy = 0, y(0) = 1$.
16. $\frac{2x}{y^3} dx + \frac{y^2 - 3x^2}{y^4} dy = 0, y(0) = 1$.
17. $\frac{2x(1 - e^y)}{(1 + x^2)^2} dx + (\frac{e^y}{1 + x^2} + 1) dy = 0, y(0) = 0$.
18. $e^x(y + y^2) dx + (1 + 2y)(1 + e^x) dy = 0, y(1) = 1$.
19. $(2x + \frac{y^2}{x^2}) dx - \frac{x y^2}{x^2 + y^2} dy = 0, y(1) = -1$.
20. $(\frac{\sin 2x}{y} + x) dx + (y - \frac{\sin^2 x}{y^2}) dy = 0, y(0) = 1$.
21. $(\frac{x}{\sqrt{x^2 + y^2}} + \frac{y}{x^2}) dx + (\frac{y}{\sqrt{x^2 + y^2}} + \frac{1}{x}) dy = 0, y(1) = 0$.
22. $(1 + y^2 \sin 2x) dx - 2y \cos^2 x dy = 0, y(0) = 1$.

23. $3x^2(1 + \ln y)dx + (\frac{x^3}{y} - 2y)dy = 0, y(1) = 1.$
 24. $(2 + \frac{x}{\sin y})dx - \frac{(x^2 + 1) \cos y}{2 \sin^2 y} dy = 0, y(0) = \frac{\pi}{4}.$
 25. $2x \cos^2 y dx + (2y - x^2 \sin 2y)dy = 0, y(0) = \frac{\pi}{4}.$
 26. $y(3x^2 + y^2)dx + x(3y^2 + x^2)dy = 0, y(1) = 0.$
 27. $(10xy - 8y + 1)dx + (5x^2 - 8x + 3)dy = 0, y(0) = 0.$
 28. $(3x^2 + 6x^2y + 3xy^2)dx + (2x^3 + 3x^2y)dy = 0, y(0) = 0.$
 29. $(\sin 2x - 2 \cos(x+y))dx - 2 \cos(x+y)dy = 0, y(0) = 0.$
 30. $(\frac{y}{x^2 + y^2} + e^x)dx = \frac{xydy}{x^2 + y^2}, y(1) = 1.$

6. Найдите общее решение дифференциального уравнения.

1. $xy' + 4y = \frac{x^5 y^2}{\sqrt{x^2 + 4}}.$
 3. $y' - 5\frac{y}{x} = \frac{y^2(x-1)}{x^3(x^2 - 2x + 4)}.$
 5. $y' = \frac{3x - y^2}{x}.$
 7. $y dx = (4x + y^2 \sqrt{x}) dy.$
 9. $y' - y = (xy)^2.$
 11. $y(y' + y) = x.$
 13. $2yy' = y^2 \cos x + 3 \sin 2x.$
 15. $y^2(y' + y) = x.$
 17. $y' = 4y + x\sqrt{y}.$
 19. $xy' + y = y^2 \ln x.$
 21. $y' - \frac{y}{x} = \frac{2y}{x}.$
 23. $3xy' + xy^2 + 2y = 0.$
 25. $y' + \frac{2y}{x} = \frac{2}{\cos^2 x} \sqrt{y}.$
 27. $xy' + 3y = \frac{x^2 y \sqrt{5 - x^2}}{\cos^2 x}.$
 29. $xy' = 4y + x^2 \sqrt{y}.$
 2. $y' + 2y = y^2 e^x.$
 4. $y' + 2xy = 2x^3 y^3.$
 6. $y' + 2y - 4xy^2 = 0.$
 8. $(x+y)y' = y.$
 10. $y' - 3y + xy^3 = 0.$
 12. $y' - 2xy = 3x^3 y^2.$
 14. $y' + \frac{y}{x+1} + y^2 = 0.$
 16. $y' - y \lg x + y^2 \cos x = 0.$
 18. $y' - y = \frac{e^x \sqrt{5 + x^3}}{x^3 y^2}.$
 20. $xy' - 4y - x^2 \sqrt{y} = 0.$
 22. $y' = y(x+y).$
 24. $xy' - 2x^2 \sqrt{y} = 4y.$
 26. $xy' = \frac{x^3 y^2}{x^2 - 3} - 2y.$
 28. $y' - y = xy^2.$
 30. $3(xy' + y) = y^2 \ln x.$

7. а) В каких точках плоскости XOY решения данного уравнения растут, убывают, имеют экстремум? б) Построить поле направлений в точках с целочисленными координатами в прямоугольнике $G: \{|x - a| \leq 3; |y| \leq 1\}$; в) Нарисовать по полю направлений приближенные решения; г) Решить данное уравнение аналитически и построить интегральную кривую, проходящую через центр прямоугольника G.

1. $y' = \frac{1}{x^2 + 1}; a = 0.$
 3. $y' = \frac{1}{x^2 - 2x + 2}; a = 1.$
 5. $y' = \frac{1}{x^2 - 4x + 5}; a = 2.$
 7. $y' = \frac{1}{x^2 - 6x + 10}; a = 3.$
 9. $y' = \frac{1}{x^2 - 8x + 17}; a = 4.$
 11. $y' = \frac{1}{x^2 - 10x + 26}; a = 5.$
 13. $y' = \frac{1}{x^2 - 12x + 37}; a = 6.$
 15. $y' = \frac{1}{x^2 - 14x + 50}; a = 7.$
 17. $y' = \frac{1}{x^2 - 16x + 65}; a = 8.$
 19. $y' = \frac{1}{x^2 - 18x + 82}; a = 9.$
 21. $y' = \frac{1}{x^2 - 20x + 101}; a = 10.$
 23. $y' = \frac{1}{x^2 - 22x + 122}; a = 11.$
 25. $y' = \frac{1}{x^2 - 24x + 145}; a = 12.$
 27. $y' = \frac{1}{x^2 - 26x + 170}; a = 13.$
 29. $y' = \frac{1}{x^2 - 28x + 197}; a = 14.$
 2. $y' = \frac{1}{x^2 + 2x + 2}; a = -1.$
 4. $y' = \frac{1}{x^2 + 4x + 5}; a = -2.$
 6. $y' = \frac{1}{x^2 + 6x + 10}; a = -3.$
 8. $y' = \frac{1}{x^2 + 8x + 17}; a = -4.$
 10. $y' = \frac{1}{x^2 + 10x + 26}; a = -5.$
 12. $y' = \frac{1}{x^2 + 12x + 37}; a = -6.$
 14. $y' = \frac{1}{x^2 + 14x + 50}; a = -7.$
 16. $y' = \frac{1}{x^2 + 16x + 65}; a = -8.$
 18. $y' = \frac{1}{x^2 + 18x + 82}; a = -9.$
 20. $y' = \frac{1}{x^2 + 20x + 101}; a = -10.$
 22. $y' = \frac{1}{x^2 + 22x + 122}; a = -11.$
 24. $y' = \frac{1}{x^2 + 24x + 145}; a = -12.$
 26. $y' = \frac{1}{x^2 + 26x + 170}; a = -13.$
 28. $y' = \frac{1}{x^2 + 28x + 197}; a = -14.$
 30. $y' = \frac{1}{x^2 + 30x + 226}; a = -15.$

8. а) В каких точках плоскости XOY решения уравнения $y' = nx + my$ растут, убывают, имеют экстремум? б) Построить поле направлений в точках с целочисленными координатами в прямоугольнике $G: \{|x| \leq 2; |y| \leq 2\}$; в) Нарисовать по полю направлений приближенные решения; г) Решить данное уравнение аналитически и построить интегральную кривую, проходящую через центр прямоугольника G; а) На отрезке $[0; 2]$ с шагом 0.1 методом Эйлера построить решение задачи Коши $y' = nx + my, y(0) = 0.$

1. $(n = 1; m = 1)$
 4. $(n = -1; m = -1)$
 7. $(n = -2; m = 1)$
 10. $(n = 3; m = -1)$
 13. $(n = 1; m = 2)$
 16. $(n = -1; m = -2)$
 2. $(n = -1; m = 1)$
 5. $(n = 2; m = 1)$
 8. $(n = -2; m = -1)$
 11. $(n = -3; m = 1)$
 14. $(n = -1; m = 2)$
 17. $(n = 1; m = 3)$
 3. $(n = 1; m = -1)$
 6. $(n = 2; m = -1)$
 9. $(n = 3; m = 1)$
 12. $(n = -3; m = -1)$
 15. $(n = 1; m = -2)$
 18. $(n = -1; m = 3)$

19. ($n = 1$; $m = -3$) 20. ($n = -1$; $m = -3$) 21. ($n = 4$; $m = 1$)
 22. ($n = -4$; $m = 1$) 23. ($n = 4$; $m = -1$) 24. ($n = -4$; $m = -1$)
 25. ($n = 2$; $m = 3$) 26. ($n = -2$; $m = 3$) 27. ($n = 2$; $m = -3$)
 28. ($n = -2$; $m = -3$) 29. ($n = 3$; $m = 2$) 30. ($n = -3$; $m = 2$)

9. Найдите решение задачи Коши.

- $y'' = x + \frac{1}{x^3}$, $y(1) = 0$, $y'(1) = -1$.
- $y'' = e^x$, $y(0) = -1$, $y'(0) = 2$.
- $y'' = \cos x$, $y(0) = -1$, $y'(0) = 5$.
- $y'' = \frac{1}{1+x^2}$, $y(0) = 0$, $y'(0) = 2$.
- $y'' = \operatorname{sh} x$, $y(0) = 0$, $y'(0) = 3$.
- $y'' = 0$, $y(-1) = 4$, $y'(-1) = 3$.
- $y'' = e^{-2x}$, $y(0) = 0$, $y'(0) = 3$.
- $y'' = \frac{1}{1+x^2}$, $y(0) = -2$, $y'(0) = -4$.
- $y'' = 3 \cos^2 x$, $y(0) = -1$, $y'(0) = 1$.
- $y'' = \sqrt[3]{(x+1)^2}$, $y(0) = 0$, $y'(0) = -\frac{2}{3}$.
- $y'' = 1 - \cos 3x$, $y(0) = 0$, $y'(0) = -4$.
- $(1+x^2)y'' = 3$, $y(0) = 0$, $y'(0) = -3$.
- $y'' + 2 \sin^2 x = 0$, $y(0) = 2$, $y'(0) = -1$.
- $y'' + 1 = 0$, $y(0) = 4$, $y'(0) = -2$.
- $y'' = \frac{1+x^2}{x}$, $y(0) = 2$, $y'(0) = -4$.
- $y'' = e^{-x/2}$, $y(0) = 2$, $y'(0) = -1$.
- $y'' = \frac{1}{\sqrt{1-x^2}}$, $y(0) = 0$, $y'(-1) = 1$.
- $y'' + 1 = x^2$, $y(-1) = 0$, $y'(0) = -1$.
- $y'' = \frac{3}{2x^2}$, $y(0) = 1$, $y'(0) = -1$.
- $y'' = 2 \sin 3x$, $y(0) = -1$, $y'(0) = 4$.
- $y'' = 2 \cos 3x$, $y(0) = -1$, $y'(0) = 0$.
- $y'' = 3 - x$, $y(0) = 0$, $y'(0) = 7$.
- $y'' = 3^x$, $y(0) = 0$, $y'(0) = -1$.
- $y'' = 98e^{3x}$, $y(1) = 1$, $y'(1) = 7$.
- $y'' = 3x$, $y(1) = 0$, $y'(1) = 3$.
- $y'' = e^{2x}$, $y(0) = 1$, $y'(0) = -0.5$.
- $xy'' = 1$, $y(1) = 2$, $y'(1) = 1$.
- $y'' = \sin 2x$, $y(0) = 1$, $y'(0) = 0$.
- $x^2 y'' = 1$, $y(1) = 2$, $y'(1) = 1$.
- $xy'' = 1 + x^2$, $y(1) = 0$, $y'(1) = 0.5$.

10. Найдите общее решение дифференциального уравнения.

- $y' - xy'' = x^2 + x^2 y''$.
- $(1+x^2)y'' - 2xy' = (1+x^2)^2$.
- $(1+x^2)y'' - 2xy' = 0$.
- $y'' \operatorname{tg} x - y' = 1$.
- $x^3 y'' + x^2 y' = \sqrt{x}$.
- $(1-x^2)y'' - 2xy' = 2$.
- $y'' \operatorname{tg} x = y'$.
- $xy'' + 2y' = x^4$.
- $y'' - \frac{y'}{x} - x = 0$.
- $y'' = -\frac{y}{x+x}$.
- $x^3 y'' + x^2 y' = 1$.
- $y' + xy'' = x$.
- $x^2 y'' + 3 - 2xy' = 0$.
- $(x+1)y'' = y' - 4$.
- $y'' = \frac{y}{x+1}$.
- $xy'' - y' = 1$.
- $x^2 y'' + xy' = 1$.
- $xy'' + y' = 0$.
- $x^2 y'' - xy' = 3x^2 - 2$.
- $(x^2 + 1)y'' + 2xy' = 2x(1+x^2)$.
- $xy'' - y' = x^3$.
- $2x^2 y' - x^3 y'' = 2$.
- $2xy' y'' = (y')^2 - 1$.
- $(x^2 + 1)y'' - 2xy' = x$.
- $(1+x^2)y'' + 2xy' = 12x^3$.
- $xy'' - y' + \frac{1}{x} = 0$.
- $xy'' = (1+2x^2)y'$.
- $xy'' + y' = x^2$.
- $(x^2 + x)y'' - y' - 1 = 0$.
- $y'' + 2y' = 4x$.

11. Найдите частное решение дифференциального уравнения.

- $y'' = 1 - (y')^2$, $y(0) = 0$, $y'(0) = 2$.
- $y'' = \sqrt{1 + (y')^2}$, $y(0) = 2$, $y'(0) = 0$.
- $3y'y'' = 2y$, $y(0) = 1$, $y'(0) = 1$.
- $y'' = e^{2y}$, $y(0) = 0$, $y'(0) = 1$.
- $y'' = 2 \sin^3 y \cos y$, $y(1) = \frac{\pi}{2}$, $y'(1) = 1$.
- $y'' = \frac{1}{3}(1 + (y')^2)^{1.5}$, $y(-2\sqrt{2}) = -1$, $y'(-2\sqrt{2}) = 2\sqrt{2}$.
- $3y'' = 2\sqrt{y'}$, $y(0) = 1$, $y'(0) = 1$.
- $y'' = yy'$, $y(1) = 0$, $y'(1) = 0.5$.
- $y'' + 2 \sin y \cos^3 y = 0$, $y(0) = 0$, $y'(0) = 1$.
- $y'' = y' \cos y$, $y(0) = \frac{\pi}{2}$, $y'(0) = 1$.
- $y'' y^3 + 36 = 0$, $y(0) = 3$, $y'(0) = 2$.
- $yy'' = -(y')^2 - (y')^3$, $y(3) = 3$, $y'(3) = 0.5$.
- $y^2 y'' = (y')^3$, $y(0) = 1$, $y'(0) = 1$.
- $y'' = \sqrt{1 - (y')^2}$, $y(0) = 2$, $y'(0) = 1$.
- $yy'' = 1.5(y')^2 + 2y^2$, $y(0) = 1$, $y'(0) = 1$.
- $y'' = y'(1 + y')$, $y(-1) = 1$, $y'(-1) = e - 1$.
- $yy'' + (y')^2 + 1 = 0$, $y(1) = 1$, $y'(1) = 0$.
- $y'' = 8y^3$, $y(0) = 1$, $y'(0) = 2$.

19. $y''y^3 + 1 = 0$, $y(1) = -1$, $y'(1) = -1$.
20. $4y''y'' = y^4 - 16$, $y(0) = 2\sqrt{2}$, $y'(0) = \frac{1}{\sqrt{2}}$.
21. $2yy'' = 1 + (y')^2$, $y(0) = 2$, $y'(0) = 1$.
22. $yy'' + y = (y')^2$, $y(-1) = 1$, $y'(-1) = 1$.
23. $2y''y'' + 1 = 0$, $y(2) = 0,5$, $y'(2) = 1,5$.
24. $y''y^3 + 4 = 0$, $y(0) = 1$, $y'(0) = 2$.
25. $y''y'' = (y')^2 + y''y'$, $y(0) = 1$, $y'(0) = 2$.
26. $2yy'' + (y')^2 = 0$, $y(2) = 4$, $y'(2) = 1$.
27. $y^2y'' = y^4 - 16$, $y(0) = 2\sqrt{2}$, $y'(0) = \sqrt{2}$.
28. $y(y^2 + 1)y'' = (3y^2 - 1)(y')^2$, $y(0) = 1$, $y'(0) = -4$.
29. $yy'' = (y')^3 - (y')^2$, $y(0) = 1$, $y'(0) = 1$.
30. $y'' + 2\sin^2 y \cos y = 0$, $y(1) = \frac{\pi}{2}$, $y'(1) = 1$.

12. Найдите общее решение уравнения.

1. $y''x \ln x = y''$.
2. $2xy'' = y''$.
3. $xy'' + y'' = x + 1$.
4. $xy'' + y'' = x + 1$.
5. $xy'' + 2y'' = 1$.
6. $xy'' = 2y''$.
7. $x^3y'' + x^2y'' = 1$.
8. $y'' \operatorname{ctg} 2x + 2y'' = 0$.
9. $\operatorname{tg} xy'' = 2y''$.
10. $(1 + x^2)y'' + 2xy'' = 0$.
11. $xy'' + 2y'' = 0$.
12. $(1 + \cos x)y'' + \sin xy'' = 0$.
13. $x^5y'' + x^4y'' = 1$.
14. $x^5y'' - x^4y'' = 1$.
15. $xy'' - y'' + \frac{1}{x} = 0$.
16. $xy'' + y'' + x = 0$.
17. $(2 - \cos x)y'' = \sin xy''$.
18. $xy'' + y'' = \sqrt{x}$.
19. $y'' \operatorname{tg} x = y'' + 1$.
20. $y'' \operatorname{tg} 5x = 5y''$.
21. $(4 + x^2)y'' = -2xy''$.
22. $x^3y'' + x^2y'' = \sqrt{x}$.
23. $y'' \cos^2 x + y'' \sin 2x = 0$.
24. $(1 + x)y'' + y'' = 1 + x$.
25. $(1 + \sin x)y'' = \cos xy''$.
26. $xy'' + y'' = \frac{1}{\sqrt{x}}$.
27. $x^3y'' - 2x^2y'' = -2$.
28. $(1 - x^2)y'' = xy''$.
29. $x(1 + x^2)y'' = (x^2 - 1)y''$.
30. $y'' \sin^2 x - y'' \sin 2x = 0$.

13. Найдите фундаментальную систему решений уравнения.

1. $y''' - 3y'' + 7y' - 5y = 0$.
2. $y''' - 5y'' + 12y' - 8y = 0$.
3. $y''' - 5y'' + 9y' - 5y = 0$.
4. $y''' - y'' + 3y' + 5y = 0$.
5. $y''' - 3y'' + 4y' + 8y = 0$.
6. $y''' - 3y'' + y' + 5y = 0$.
7. $y''' + y'' + 3y' - 5y = 0$.
8. $y''' + 3y'' + 4y' - 8y = 0$.
9. $y''' + 3y'' + 3y' + 7y' + 5y = 0$.
10. $y''' + 3y'' + 7y' + 5y = 0$.
11. $y''' + 5y'' + 12y' + 8y = 0$.
12. $y''' + 5y'' + 9y' + 5y = 0$.

13. $y''' - 3y'' + 4y' - 2y = 0$.
14. $y''' - y'' + 2y = 0$.
15. $y''' + y'' - 2y = 0$.
16. $y''' - 4y'' + 6y' - 4y = 0$.
17. $y''' - 2y'' - 4y = 0$.
18. $y''' - 4y'' + 9y' - 10y = 0$.
19. $y''' + y' - 10y = 0$.
20. $y''' - 6y'' + 13y' - 10y = 0$.
21. $y''' + 2y'' - 3y' - 10y = 0$.
22. $y''' - 6y'' + 16y' - 16y = 0$.
23. $y''' + 2y'' - 16y = 0$.
24. $y''' - 2y'' + 4y = 0$.
25. $y''' + 4y'' + 6y' + 4y = 0$.
26. $y''' + y' + 10y = 0$.
27. $y''' + 4y'' + 9y' + 10y = 0$.
28. $y''' + 3y'' + 4y' + 2y = 0$.
29. $y''' + 6y'' + 13y' + 10y = 0$.
30. $y''' - 2y'' + 16y = 0$.

14. Найдите общее решение дифференциального уравнения.

1. $y'' - 8y' + 17y = 3x + \sin 2x$.
2. $y'' + 2y' + 6y = 3e^x + \sin 2x + 5$.
3. $y'' - 9y' = (x^2 + 4)e^{3x}$.
4. $y'' - 5y' + 6y = (2x - 7)e^{-x}$.
5. $y'' + 5y' + 6y = 12 \cos 2x - 8 \sin 2x$.
6. $y'' - 2y' + 5y = 2xe^x - 3 \sin 2x$.
7. $y'' + 2y' + 2y = 5x - 3 + 4 \sin x$.
8. $y'' - 3y' + 2y = 3x - 4$.
9. $y'' - 2y' + 2y = 5e^{-x}$.
10. $y'' - 4y' + 5y = \cos x$.
11. $y'' - 2y' + 2y = 6xe^x$.
12. $y'' + 6y' + 9y = 10 \sin x$.
13. $y'' - 8y' + 17y = 4 \sin x$.
14. $y'' - 2y' - 3y = x^2 + 4x$.
15. $y'' + 6y' + 10y = 3x - 2 \cos x$.
16. $y'' - 4y' + 4y = 2(x - \sin 2x)$.
17. $y'' + 6y' + 13y = 26x - 1$.
18. $y'' + y = 4e^x$.
19. $y'' - 4y' + 4y = 25 \sin xe^{2x}$.
20. $y'' - 2y' + 5y = 5x^2 - 4x + 2$.
21. $y'' - 2y' + 10y = 10x^2 + 18x + 6$.
22. $y'' - 4y' + 5y = 4x - \cos x$.
23. $y'' - 4y' + 3y = x^2 - e^{2x}$.
24. $y'' - 9y' = (x^2 + 3)e^{3x}$.
25. $y'' - 2y' + 5y = 2xe^x - \sin 2x$.
26. $y'' - y' = xe^{2x}$.
27. $y'' + 5y' + 6y = 4 \cos 2x - 8 \sin 2x$.
28. $y'' - 3y' + 2y = e^x \sin x$.
29. $y'' - 3y' - 4y = 3 \sin x$.
30. $y'' - 4y = 4xe^x$.

15. Найдите решение задачи Коши.

1. $y'' - 4y' + 5y = 2e^{2x} \sin x$, $y(0) = 2$, $y'(0) = 8$.
2. $y'' - y' = 5x^2 - 2$, $y(0) = 0$, $y'(0) = 0$.
3. $y'' + y = 2 \cos x$, $y(0) = 1$, $y'(0) = 0$.
4. $y'' - 2y' + 5y = e^x \cos 2x$, $y(0) = 0$, $y'(0) = 2$.
5. $y'' - 4y' - 5y = 2x^2e^{-x}$, $y(0) = 3$, $y'(0) = -1$.
6. $y'' - 4y' + 8y = 2 \sin 2xe^{2x}$, $y(0) = 1$, $y'(0) = 0$.
7. $y'' - 6y' + 13y = xe^{3x} \sin 2x$, $y(0) = 2$, $y'(0) = 8$.
8. $y'' + 6y' + 10y = 2xe^{-3x} \cos x$, $y(0) = 1$, $y'(0) = 3$.
9. $y'' + y' - 2y = 5xe^x$, $y(0) = 0$, $y'(0) = -1$.
10. $y'' + 2y' + 10y = 2e^{-x} \cos 3x$, $y(0) = 1$, $y'(0) = 0$.
11. $4y'' + 16y' + 15y = 4e^{-\frac{x}{2}}$, $y(0) = 3$, $y'(0) = -5,5$.
12. $y'' + 4y' + 13y = e^{-2x} \cos 3x$, $y(0) = 0$, $y'(0) = 2$.
13. $y'' - 4y' - 5y = 2xe^{-x}$, $y(0) = 3$, $y'(0) = -1$.

14. $y'' - 4y' + 8y = 2 \cos 2x e^{2x}$, $y(0) = 1$, $y'(0) = 0$.
15. $y'' - 3y' + 2y = e^x + 3 \sin x$, $y(0) = 0$, $y'(0) = 1$.
16. $y'' + 2y' + 2y = x + 4 - e^{-2x}$, $y(0) = 0$, $y'(0) = 1$.
17. $y'' - 2y' + 5y = e^{\cos 2x} + 1$, $y(0) = 0$, $y'(0) = 1$.
18. $y'' - 4y' + 3y = \sin 2x - 4e^{2x}$, $y(0) = 0$, $y'(0) = 2$.
19. $y'' - y' = 1 - x + 4x^2$, $y(0) = 0$, $y'(0) = -2$.
20. $y'' - 5y' = 3x - 2 + e^{3x}$, $y(0) = 0$, $y'(0) = -3$.
21. $y'' - 8y' + 17y = e^{4x} \sin x + x$, $y(0) = 1$, $y'(0) = 0$.
22. $y'' + 3y' + 2y = xe^{-x} + 3$, $y(0) = 0$, $y'(0) = 1$.
23. $y'' + 4y' + 5y = 3e^{-2x} \sin x$, $y(0) = 0$, $y'(0) = -2$.
24. $y'' - 9y = (x^2 + 1)e^{3x}$, $y(0) = 0$, $y'(0) = 1$.
25. $y'' + y = 3x \sin x$, $y(0) = 1$, $y'(0) = 0$.
26. $y'' - 2y' + 5y = 3 \sin 2x e^{2x}$, $y(0) = 0$, $y'(0) = 0$.
27. $y'' - 4y' + 5y = 4x \cos x e^{2x}$, $y(0) = 1$, $y'(0) = 0$.
28. $y'' - 4y' + 3y = x^2 - 3e^x$, $y(0) = 2$, $y'(0) = 1$.
29. $y'' - y = x^2 e^{-x}$, $y(0) = 0$, $y'(0) = 0$.
30. $y'' - 4y = x e^{2x}$, $y(0) = 3$, $y'(0) = 1$.

16. Найти общее решение дифференциального уравнения.

1. $y'' - 4y' + 4y = f(x)$, где $f(x) = e^{-x}(x^2 - 2)$ и $f(x) = e^{2x}(3x + 1)$.
2. $y'' - 2y' + y = f(x)$, где $f(x) = x^2 + 2x - 2$ и $f(x) = e^{2x}(3x - 1)$.
3. $y'' - 6y' + 9y = f(x)$, где $f(x) = e^{-x}(12x - 7)$ и $f(x) = e^{3x}(x + 2)$.
4. $y'' + 2y' + y = f(x)$, где $f(x) = 5x^2 e^{2x}$ и $f(x) = e^{-x}(x + 3)$.
5. $y'' + 6y' + 9y = f(x)$, где $f(x) = x^2 + 2x - 3$ и $f(x) = e^{-3x}(x - 2)$.
6. $y'' + 2y' + y = f(x)$, где $f(x) = x e^x + 1$ и $f(x) = e^{-x}(3 - x)$.
7. $y'' + 4y' + 4y = f(x)$, где $f(x) = e^x(x^2 - 2)$ и $f(x) = e^{-2x}(x + 1)$.
8. $y'' - 2y' + y = f(x)$, где $f(x) = x^2 - x + 2$ и $f(x) = e^x(x + 1)$.
9. $y'' - 8y' + 16y = f(x)$, где $f(x) = e^{2x}(2x^2 + 1)$ и $f(x) = e^{4x}(x - 2)$.
10. $y'' + 2y' + y = f(x)$, где $f(x) = 2x^2 - x + 3$ и $f(x) = e^{-x}(x - 2)$.
11. $y'' - 2y' + y = f(x)$, где $f(x) = e^{2x}(x - 1) + x^2$ и $f(x) = e^x(2x + 1)$.
12. $y'' + 8y' + 16y = f(x)$, где $f(x) = e^{-x}(x^2 - 2)$ и $f(x) = e^{-4x}(x + 2) + 1$.
13. $y'' + 4y' + 4y = f(x)$, где $f(x) = e^{2x}(x + 1) - 2x$ и $f(x) = e^{-2x}(1 - 4x)$.
14. $y'' - 6y' + 9y = f(x)$, где $f(x) = x e^{4x} - 1$ и $f(x) = e^{3x}(2x + 1)$.
15. $y'' + 8y' + 16y = f(x)$, где $f(x) = x^2 + 3x - 1$ и $f(x) = e^{-4x}(2 - x)$.
16. $y'' + 6y' + 9y = f(x)$, где $f(x) = e^x(x^2 - 2) + x$ и $f(x) = e^{-3x}(3x + 1)$.
17. $y'' - 6y' + 9y = f(x)$, где $f(x) = x e^x + 1$ и $f(x) = e^{3x}(2x + 1)$.
18. $y'' + 2y' + y = f(x)$, где $f(x) = e^x(x - 1) + 2x$ и $f(x) = e^{-x}(1 - 2x)$.
19. $y'' - 2y' + y = f(x)$, где $f(x) = e^{-x}(x^2 + x)$ и $f(x) = e^x(x + 2) + 1$.
20. $y'' + 4y' + 4y = f(x)$, где $f(x) = e^{2x}(x - 1) + x^3$ и $f(x) = e^{-2x}(2x + 1)$.
21. $y'' - 10y' + 25y = f(x)$, где $f(x) = e^x(3 - x^2)$ и $f(x) = e^{5x}(x - 2)$.
22. $y'' - 2y' + y = f(x)$, где $f(x) = x^2 - x + 3$ и $f(x) = e^{5x}(x + 2)$.
23. $y'' - 6y' + 9y = f(x)$, где $f(x) = e^x(x^2 + 1)$ и $f(x) = e^{3x}(2x + 1)$.

24. $y'' + 8y' + 16y = f(x)$, где $f(x) = x e^x + x^2$ и $f(x) = e^{-4x}(2 - x)$.
25. $y'' - 2y' + y = f(x)$, где $f(x) = e^{2x}(x - 1) + x^2$ и $f(x) = e^x(3x + 2)$.
26. $y'' + 4y' + 4y = f(x)$, где $f(x) = e^x(x - 2) + x^2$ и $f(x) = e^{-2x}(3 - x)$.
27. $y'' + 4y' + 4y = f(x)$, где $f(x) = 2x^2 - x + 4$ и $f(x) = e^{-2x}(x - 2) + \sin x$.
28. $y'' + 2y' + y = f(x)$, где $f(x) = e^{2x} + x^2$ и $f(x) = e^{-x}(3 + x)$.
29. $y'' - 6y' + 9y = f(x)$, где $f(x) = e^x(x - 1) + x^2$ и $f(x) = e^{3x}(2x + 1)$.
30. $y'' + 2y' + y = f(x)$, где $f(x) = x e^{2x} + x^2$ и $f(x) = e^{-x}(2x + 3)$.

17. Найти общее решение дифференциального уравнения.

1. $y'' + 3y' + 2y = \frac{1}{1 + e^x}$.
2. $y'' + y = \frac{1}{\sin x}$.
3. $y'' + y = \frac{2}{\cos^3 x}$.
4. $y'' + 4y = 2 \operatorname{tg} x$.
5. $y'' + 2y' + y = 3e^{-x} \sqrt{x + 1}$.
6. $y'' - 3y' + 2y = \frac{1}{e^{2x} - 1}$.
7. $y'' + y = \operatorname{ctg}^2 x$.
8. $y'' + 4y' + 4y = \frac{x}{e^x}$.
9. $y'' + 2y' + y = \frac{2e^{-x}}{x}$.
10. $y'' + 9y = \operatorname{tg}^2 3x$.
11. $y'' - 2y' + y = \frac{e^x}{1 + x^2}$.
12. $y'' + 3y' + 2y = \frac{1}{1 - e^{2x}}$.
13. $y'' + y' = \frac{e^{2x}}{\sqrt{1 - e^{2x}}}$.
14. $y'' - y' = \frac{e^{4x}}{x}$.
15. $y'' + 9y = \frac{\cos 3x}{\sin 2x}$.
16. $y'' - 8y' + 16y = \frac{e^{4x}}{x^2}$.
17. $y'' + 4y = \frac{1}{\sin 2x}$.
18. $y'' - 2y' + y = \frac{e^x}{x^2}$.
19. $y'' - 2y' + y = \frac{1}{x}$.
20. $y'' + 4y = \operatorname{ctg}^2 2x$.
21. $y'' + y' = \frac{1}{e^x - 1}$.
22. $y'' + y = \operatorname{ctg} x$.
23. $y'' + 2y' = \frac{3e^{-x}}{1 + e^{2x}}$.
24. $y'' + y = 2 \operatorname{ctg} x$.
25. $y'' + 2y' + y = \frac{9e^{-x}}{1 + e^{3x}}$.
26. $y'' + 3y' = \frac{9e^{3x}}{1 + e^{3x}}$.
27. $y'' + 9y = \frac{9}{\cos 3x}$.
28. $y'' + 3y' = \frac{9e^{3x}}{1 + e^{3x}}$.
29. $y'' - 6y' + 8y = \frac{4}{1 + e^{-2x}}$.
30. $y'' - 9y' + 18y = \frac{9e^{3x}}{1 + e^{3x}}$.

18. Найти общее решение системы дифференциальных уравнений.

1. $\begin{cases} \dot{x} = 2x + y + 2e^t \\ \dot{y} = x + 2y - 3e^{4t} \end{cases}$
2. $\begin{cases} \dot{x} = y - 5 \cos t \\ \dot{y} = 2x + y \end{cases}$

3. $\begin{cases} \dot{x} = x + 2y \\ \dot{y} = x - 5 \sin t \end{cases}$
5. $\begin{cases} \dot{x} = 2x - 4y \\ \dot{y} = x - 3y + 3e^t \end{cases}$
7. $\begin{cases} \dot{x} = 3x - 4y + e^{-2t} \\ \dot{y} = x - 2y - 3e^{-2t} \end{cases}$
9. $\begin{cases} \dot{x} = 2x - y \\ \dot{y} = 2y - x - 5e^t \sin t \end{cases}$
11. $\begin{cases} \dot{x} = 2x + 3y + 5t \\ \dot{y} = 3x + 2y + 8e^t \end{cases}$
13. $\begin{cases} \dot{x} = 4x - 3y + \sin t \\ \dot{y} = 2x - y - 2 \cos t \end{cases}$
15. $\begin{cases} \dot{x} = -x + 3y \\ \dot{y} = x + y + 1 + e^t \end{cases}$
17. $\begin{cases} \dot{x} = 4x + y - e^{2t} \\ \dot{y} = y - 2x \end{cases}$
19. $\begin{cases} \dot{x} = y + 2e^t \\ \dot{y} = -x + 2y \end{cases}$
21. $\begin{cases} \dot{x} = 2x - 3y + 2 \sin t \\ \dot{y} = 2y - x + 1 \end{cases}$
23. $\begin{cases} \dot{x} = 3y - 2x \\ \dot{y} = 3y - 2x \end{cases}$
25. $\begin{cases} \dot{x} = 2x + 4y - 8 \\ \dot{y} = 3x + 6y \end{cases}$
27. $\begin{cases} \dot{x} = y + 2e^t \\ \dot{y} = x + t^2 \end{cases}$
29. $\begin{cases} \dot{x} = -2x + 2y \\ \dot{y} = 2x + y + 16te^t \end{cases}$
4. $\begin{cases} \dot{x} = 3x - 2y \\ \dot{y} = -y + 2x + 1 \end{cases}$
6. $\begin{cases} \dot{x} = 2x - y \\ \dot{y} = y - 2x + 18t \end{cases}$
8. $\begin{cases} \dot{x} = 2y - x - 2 \cos t \\ \dot{y} = 4y - 3x + \sin t \end{cases}$
10. $\begin{cases} \dot{x} = 5y - x \\ \dot{y} = y - x + 8t \end{cases}$
12. $\begin{cases} \dot{x} = 3x + 2y + 4e^{2t} \\ \dot{y} = x + 2y \end{cases}$
14. $\begin{cases} \dot{x} = x + y + 1 + e^t \\ \dot{y} = 3x - y \end{cases}$
16. $\begin{cases} \dot{x} = 2x - 3y + 4 \sin t + 2 \cos t \\ \dot{y} = x - 2y + 2 \sin t \end{cases}$
18. $\begin{cases} \dot{x} = x - y + 8t \\ \dot{y} = 5x - y \end{cases}$
20. $\begin{cases} \dot{x} = 2x - y \\ \dot{y} = x + 2e^t \end{cases}$
22. $\begin{cases} \dot{x} = 5x - 3y + 2e^{2t} \\ \dot{y} = x + y + 5e^{-t} \end{cases}$
24. $\begin{cases} \dot{x} = -3x + y + 3e^t \\ \dot{y} = -4x + 2y \end{cases}$
26. $\begin{cases} \dot{x} = -3x + 4y + 4e^t \\ \dot{y} = 3x - 4y + 6e^t \end{cases}$
28. $\begin{cases} \dot{x} = 6x + 3y \\ \dot{y} = 4x + 2y - 8 \end{cases}$
30. $\begin{cases} \dot{x} = x + 2y + 16te^t \\ \dot{y} = 2x - 2y \end{cases}$

19. Найти общее решение системы уравнений $\dot{x} = Ax$, где $\dot{x} = \frac{dx}{dt}$, $x^T = (x_1, x_2, x_3)$.

1. $A = \begin{pmatrix} 5 & -6 & 6 \\ 1 & 0 & 1 \\ -2 & 4 & -3 \end{pmatrix}$
3. $A = \begin{pmatrix} 4 & -1 & 4 \\ 1 & 1 & 1 \\ 1 & -1 & 3 \end{pmatrix}$
5. $A = \begin{pmatrix} 1 & 1 & -1 \\ -1 & 1 & 1 \\ -1 & 2 & 0 \end{pmatrix}$
2. $A = \begin{pmatrix} 1 & -1 & 1 \\ -2 & 1 & -1 \\ 0 & 1 & -1 \end{pmatrix}$
4. $A = \begin{pmatrix} 2 & -1 & 1 \\ 1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$
6. $A = \begin{pmatrix} -1 & 1 & 0 \\ -1 & 1 & -2 \\ 1 & -1 & 1 \end{pmatrix}$

7. $A = \begin{pmatrix} 1 & 1 & 1 \\ -1 & 3 & 1 \\ 4 & -1 & 4 \end{pmatrix}$
9. $A = \begin{pmatrix} 0 & 2 & -1 \\ 1 & 1 & -1 \\ -1 & 1 & 1 \end{pmatrix}$
11. $A = \begin{pmatrix} 4 & 4 & -1 \\ 1 & 3 & -1 \\ 1 & 1 & 1 \end{pmatrix}$
13. $A = \begin{pmatrix} 1 & 1 & -1 \\ 2 & 0 & -1 \\ 1 & -1 & 1 \end{pmatrix}$
15. $A = \begin{pmatrix} 2 & -1 & -1 \\ 12 & -4 & -12 \\ -4 & 1 & 5 \end{pmatrix}$
17. $A = \begin{pmatrix} 0 & -1 & 2 \\ -1 & 1 & 1 \\ 1 & -1 & 1 \end{pmatrix}$
19. $A = \begin{pmatrix} 1 & -1 & -2 \\ 1 & -1 & 0 \\ -1 & 1 & 1 \end{pmatrix}$
21. $A = \begin{pmatrix} 3 & 12 & -4 \\ -1 & -3 & 1 \\ -1 & -12 & 6 \end{pmatrix}$
23. $A = \begin{pmatrix} -1 & 0 & 1 \\ 1 & 1 & -1 \\ -1 & -2 & 1 \end{pmatrix}$
25. $A = \begin{pmatrix} 2 & 1 & -1 \\ 1 & 2 & -1 \\ 1 & 2 & -1 \end{pmatrix}$
27. $A = \begin{pmatrix} 0 & 1 & 1 \\ 4 & -3 & -2 \\ -6 & 6 & 5 \end{pmatrix}$
29. $A = \begin{pmatrix} 0 & 0 & -1 \\ 4 & 1 & 4 \\ 0 & 1 & 0 \end{pmatrix}$
8. $A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & 1 \\ 1 & -1 & 2 \end{pmatrix}$
10. $A = \begin{pmatrix} 1 & -2 & -1 \\ -1 & 1 & 1 \\ 1 & 0 & -1 \end{pmatrix}$
12. $A = \begin{pmatrix} -1 & 2 & 1 \\ -1 & 1 & 2 \\ -3 & -2 & 4 \end{pmatrix}$
14. $A = \begin{pmatrix} 6 & 5 & -6 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{pmatrix}$
16. $A = \begin{pmatrix} 2 & 1 & -1 \\ 1 & 2 & -1 \\ -1 & 1 & 2 \end{pmatrix}$
18. $A = \begin{pmatrix} 5 & 6 & -6 \\ -2 & -3 & 4 \\ 1 & 1 & 0 \end{pmatrix}$
20. $A = \begin{pmatrix} 3 & 1 & -1 \\ 4 & 4 & -1 \\ 1 & 1 & 1 \end{pmatrix}$
22. $A = \begin{pmatrix} -3 & 4 & -2 \\ 1 & 0 & 1 \\ 6 & -6 & 5 \end{pmatrix}$
24. $A = \begin{pmatrix} 3 & -1 & 1 \\ 1 & 1 & 1 \\ 4 & -1 & 4 \end{pmatrix}$
26. $A = \begin{pmatrix} 1 & 1 & -1 \\ 1 & 1 & -1 \\ 2 & -1 & 0 \end{pmatrix}$
28. $A = \begin{pmatrix} -3 & -1 & 1 \\ 12 & 3 & -4 \\ -12 & -1 & 6 \end{pmatrix}$
30. $A = \begin{pmatrix} 0 & 1 & 1 \\ -6 & 5 & 6 \\ 4 & -2 & -3 \end{pmatrix}$

20. Найти общее решение системы уравнений: $\dot{x} = Ax$, где $\dot{x} = \frac{dx}{dt}$, $x^T = (x_1, x_2, x_3)$.

1. $A = \begin{pmatrix} 21 & -8 & -19 \\ 18 & -7 & -15 \\ 16 & -6 & -15 \end{pmatrix}$
2. $A = \begin{pmatrix} 0 & 2 & 1 \\ 1 & -1 & -2 \\ -1 & 2 & 2 \end{pmatrix}$

Таблица вариантов

В	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
1	13	30	19	17	15	24	21	8	3	27	26	4	26	22	19	2	6	9	5	21			
2	27	2	16	27	11	18	30	19	28	20	18	25	4	1	18	4	9	26	28	27			
3	25	20	27	18	8	5	30	4	4	26	11	23	1	5	7	13	5	8	25	7			
4	22	27	18	8	5	30	1	15	4	8	16	5	1	23	27	3	25	19	5	22			
5	5	8	17	18	16	19	30	11	9	20	27	20	18	8	9	16	20	17	27	28			
6	13	29	3	4	7	29	26	20	6	27	1	28	16	13	9	23	11	17	27	12			
7	24	10	27	8	3	9	8	20	15	12	26	6	21	2	30	11	10	1	30	11			
8	6	10	1	2	4	12	11	30	13	8	22	22	23	25	13	22	15	1	14	6			
9	17	10	4	28	6	18	23	29	4	2	28	16	6	24	9	5	27	29	30	12			
10	22	26	17	7	28	10	19	11	20	8	4	25	11	29	3	1	22	7	15	21			
11	10	19	30	4	13	27	17	1	10	27	13	15	9	26	29	21	30	16	23	12			
12	15	6	9	17	26	9	21	18	6	27	28	16	9	3	4	8	18	23	16	16			
13	17	15	14	10	4	9	24	8	27	28	16	9	3	4	8	18	23	16	16	16			
14	28	23	2	22	23	14	3	21	25	25	26	20	20	15	4	26	17	26	17	17			
15	18	17	21	24	28	25	19	30	14	26	3	23	28	3	29	29	22	20	20	20			
16	7	21	18	3	14	5	18	9	3	1	7	16	28	18	30	16	30	26	10	11			
17	2	21	17	13	14	28	18	21	16	23	22	21	12	19	2	22	7	12	12	7			
18	22	24	17	13	30	12	24	7	20	19	10	15	18	15	4	23	4	24	4	29	25		
19	11	8	13	22	7	19	7	26	20	22	18	25	5	12	10	13	5	2	23	2	6		
20	6	4	9	9	27	8	29	28	17	7	17	23	21	21	19	23	3	8	5	7	29	24	22
21	4	9	9	27	8	29	28	17	7	17	23	21	21	19	23	3	8	5	7	29	24	22	
22	16	10	1	12	26	21	7	17	23	21	21	19	23	3	8	5	7	29	24	22			
23	12	14	1	12	16	6	11	23	14	25	5	13	27	4	10	22	5	23	24	4	14	4	14
24	23	28	23	16	5	18	27	14	13	26	27	20	9	2	7	9	9	26	10	23	2	28	2
25	2	27	21	22	22	14	13	26	27	20	9	2	7	9	9	26	10	23	2	28	2	28	2
26	18	12	12	22	24	4	14	9	16	3	3	21	24	14	1	3	27	17	13	12	12	12	12
27	11	6	9	27	7	13	26	21	25	15	15	30	22	4	8	30	29	9	19	27	27	27	27
28	8	8	3	5	12	10	18	30	3	4	22	21	27	33	30	18	9	19	27	27	27	27	27
29	8	8	3	5	12	10	18	30	3	4	22	21	27	33	30	18	9	19	27	27	27	27	27
30	7	8	1	20	16	19	21	16	18	11	20	24	11	12	12	5	13	25	8	15	15	15	15
31	14	14	3	5	4	2	21	13	21	7	14	30	27	11	26	20	11	24	26	8	27	27	27
32	26	14	1	7	23	17	19	21	16	18	11	20	24	11	26	20	11	24	26	8	27	27	27
33	8	5	22	28	6	8	22	1	1	18	6	15	25	29	7	24	14	25	18	27	11	14	14
34	5	22	28	6	8	22	1	1	18	6	15	25	29	7	24	14	25	18	27	11	14	14	14
35	23	22	19	27	27	4	20	14	23	29	17	2	27	11	29	9	1	13	4	14	14	14	14
36	22	22	29	15	23	5	3	9	13	11	10	13	12	2	18	25	29	25	19	29	29	29	29
37	20	28	23	19	13	21	14	30	26	26	23	28	12	23	9	7	20	13	25	26	26	26	26
38	16	12	9	15	13	11	19	18	29	4	15	30	4	7	25	12	8	15	2	8	8	8	8
39	20	26	19	25	27	15	8	21	10	19	20	15	22	16	2	30	23	12	25	17	17	17	17
40	20	8	15	23	30	9	30	24	6	2	30	12	11	14	6	21	24	14	24	14	14	14	14
41	13	10	11	15	17	23	1	22	19	23	8	10	11	14	6	21	24	14	24	14	14	14	14
42	29	5	5	13	16	9	7	21	26	11	9	18	23	19	10	10	10	10	10	10	10	10	10
43	5	10	17	7	3	8	1	2	30	13	31	5	27	11	2	4	20	3	24	30	21	5	6
44	0	17	7	3	8	1	2	30	13	31	5	27	11	2	4	20	3	24	30	21	5	6	6
45	21	22	7	21	6	1	2	17	4	21	1	4	20	3	24	30	21	5	23	5	6	6	6
46	12	8	23	18	9	17	14	6	24	2	10	5	4	27	19	4	19	21	25	12	12	12	12
47	8	20	13	18	9	17	14	6	24	2	10	5	4	27	19	4	19	21	25	12	12	12	12
48	15	11	26	20	5	4	28	25	18	6	1	21	6	19	28	10	4	5	27	7	7	7	7
49	13	21	10	14	2	1	24	28	12	5	9	26	13	23	14	30	2	9	17	18	18	18	18
50	7	2	2	8	20	23	10	22	19	29	15	26	6	11	24	3	18	18	25	26	26	26	26
51	28	15	10	13	11	11	26	28	25	30	12	30	26	10	5	17	14	21	3	2	2	2	2
52	2	21	30	17	12	14	9	26	16	26	24	2	15	10	5	7	11	20	24	10	10	10	10
53	23	11	8	1	13	1	15	20	8	18	18	16	5	30	7	18	7	10	15	17	17	17	17
54	8	29	10	7	29	17	20	28	21	15	16	4	14	1	23	8	30	4	29	17	17	17	17
55	16	25	15	16	30	6	21	20	1	21	20	17	13	14	4	15	15	5	2	2	2	2	2
56	9	30	2	20	9	30	18	1	5	11	7	12	36	30	6	12	3	20	19	3	3	3	3
57	40	21	24	8	20	2	20	22	20	22	20	21	20	21	20	21	20	21	20	21	20	20	20
58	2	12	0	25	1	26	20	22	20	22	20	21	20	21	20	21	20	21	20	21	20	20	20
59	30	20	25	9	28	24	14	5	26	1	10	9	28	19	3	8	17	21	3	3	3	3	3
60	20	25	9	28	24	14	5	26	1	10	9	28	19	3	8	17	21	3	3	3	3	3	3

3. A =	2	0	1	3	0
4. A =	-1	1	1	-1	-1
5. A =	2	1	-1	1	0
6. A =	-2	1	0	4	3
7. A =	2	2	-1	3	2
8. A =	-2	-1	1	2	0
9. A =	1	2	0	-1	3
10. A =	1	-2	0	3	4
11. A =	-1	-2	1	-2	-1
12. A =	-15	16	-6	2	2
13. A =	-19	21	-8	2	1
14. A =	-15	18	-7	0	0
15. A =	3	2	-1	1	0
16. A =	0	1	1	0	3
17. A =	-1	0	-2	0	1
18. A =	1	0	-1	21	-19
19. A =	3	-4	4	16	-15
20. A =	1	-1	2	18	-15
21. A =	-1	1	-2	3	1
22. A =	2	0	1	1	2
23. A =	1	1	0	-4	3
24. A =	0	3	1	0	1
25. A =	-7	18	-15	0	1
26. A =	-8	21	-19	-1	2
27. A =	-6	16	-15	1	-2
28. A =	3	-1	1	1	-1
29. A =	2	3	-1	3	1
30. A =	1	0	2	-15	-6
	4	-4	3	-15	-7
	-2	0	1	-19	-8
	2	-1	1	2	1
	1	0	2	1	0
	-2	1	-1	-1	3
	1	1	0	-1	3
	1	1	0	-5	2
	3	0	1	4	0

BOBA Penu HAM
 Bay. N 31
 Bay. N 64
 Bay. N 70

B	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
61	26	14	24	13	7	9	17	2	24	10	18	2	13	21	18	6	8	13	13	4
62	30	8	29	21	13	1	15	26	20	10	29	2	22	28	24	6	26	6	6	26
63	15	22	22	8	20	6	27	19	20	13	22	19	14	10	24	14	17	23	11	11
64	21	19	10	21	10	22	18	22	13	24	12	20	29	15	6	24	15	18	27	18
65	15	16	20	16	22	18	22	13	24	11	1	20	8	30	23	6	16	4	18	9
66	8	15	15	2	16	15	16	21	3	1	11	14	23	28	10	14	4	18	9	9
67	7	20	8	16	22	16	3	13	10	17	1	9	16	12	6	5	4	10	21	23
68	29	16	5	9	28	30	7	3	27	19	28	15	13	30	29	10	21	23	26	7
69	29	16	5	9	28	30	7	3	27	19	28	15	13	30	29	10	21	23	26	7
70	3	23	3	3	1	15	29	15	30	13	14	27	28	25	10	2	15	12	23	19
71	9	27	20	21	16	17	1	9	15	5	27	27	19	17	21	7	27	8	17	4
72	30	3	24	22	28	23	28	9	15	5	27	27	20	29	20	23	27	20	23	26
73	2	13	23	19	11	6	20	9	15	6	21	7	13	23	22	19	18	5	26	28
74	10	22	14	19	23	22	5	14	6	21	7	13	23	22	19	17	4	8	17	4
75	3	21	28	4	1	8	22	30	2	4	27	22	19	1	17	4	23	21	22	7
76	3	21	28	4	1	8	22	30	2	4	27	22	19	1	17	4	23	21	22	7
77	23	9	10	3	21	12	24	13	25	20	26	21	29	17	21	26	28	24	10	13
78	23	9	10	3	21	12	24	13	25	20	26	21	29	17	21	26	28	24	10	13
79	6	20	17	8	8	2	24	30	17	18	11	28	12	4	2	6	7	10	20	23
80	21	11	14	26	11	18	18	13	27	26	4	26	22	1	24	26	18	9	3	3
81	13	30	19	17	11	24	21	8	3	27	26	4	26	22	1	24	26	18	9	3
82	27	2	6	27	15	18	30	19	28	29	18	23	1	5	7	13	5	8	26	27
83	25	20	27	8	5	30	1	15	4	8	16	5	1	23	27	3	25	19	5	27
84	22	27	18	8	5	30	1	15	4	8	16	5	1	23	27	3	25	19	5	27
85	8	17	1	18	15	16	19	30	11	9	20	27	20	18	8	9	16	20	19	28
86	13	29	3	4	7	29	26	20	6	27	1	28	16	13	9	23	11	17	27	12
87	24	10	27	8	3	9	8	20	15	12	26	6	21	2	30	11	10	1	30	11
88	6	10	1	2	4	12	11	30	13	8	22	22	23	25	13	22	15	1	14	6
89	17	10	4	28	6	18	23	29	4	2	28	16	6	24	9	5	27	29	30	12
90	22	26	17	7	28	10	19	11	20	8	4	25	11	29	3	1	22	7	15	21
91	18	0	4	13	27	17	1	10	27	13	15	9	26	29	21	30	16	23	12	12
92	15	9	17	4	9	21	16	6	27	12	13	9	13	4	8	8	23	16	16	16
93	17	15	14	10	10	4	15	27	12	16	9	3	14	4	12	12	2	23	2	2
94	28	23	2	22	25	14	5	27	28	16	9	3	14	4	12	12	2	23	2	2
95	18	3	24	6	28	23	3	27	2	12	30	23	12	22	24	4	23	29	22	20
96	10	17	21	24	8	25	19	30	14	36	30	23	12	22	24	4	23	29	22	20
97	2	21	18	3	14	5	18	9	3	1	7	16	28	18	30	16	30	25	21	15
98	22	24	17	19	13	14	28	18	21	16	23	22	21	12	19	2	22	7	7	11
99	11	8	13	30	12	24	7	20	19	10	15	18	15	4	23	4	24	4	29	25
100	6	11	22	7	19	7	26	20	22	18	25	5	12	10	13	5	2	23	2	6
101	27	16	4	5	19	9	20	28	22	11	14	8	11	23	9	23	9	21	12	10
102	3	9	14	3	14	3	16	29	20	8	17	5	29	28	27	22	1	15	14	10
103	3	22	16	11	9	17	21	23	18	13	29	23	4	17	9	17	3	11	6	6
104	6	24	5	5	8	9	10	19	9	4	8	28	19	14	18	23	2	4	20	20
105	15	2	27	27	5	14	11	12	15	5	19	20	11	20	22	12	21	8	11	11
106	10	1	5	12	14	8	15	23	6	20	5	17	1	18	21	2	24	5	26	1
107	18	25	26	16	22	12	9	11	12	3	22	18	26	3	5	26	2	13	14	26
108	17	1	16	26	9	14	17	9	12	4	1	18	12	18	5	26	24	16	8	20
109	17	1	16	26	9	14	17	9	12	4	1	18	12	18	5	26	24	16	8	20
110	7	1	6	2	25	19	15	2	18	7	13	25	1	18	26	20	2	13	14	26
111	18	3	18	5	23	16	19	3	18	7	13	25	1	18	26	20	2	13	14	26
112	5	13	16	7	4	5	15	3	29	10	10	15	15	22	26	20	2	13	14	26
113	16	13	23	26	2	17	2	3	24	8	8	2	16	10	16	21	6	18	9	12
114	9	25	21	13	12	16	24	2	13	15	4	5	21	10	11	27	20	16	21	12
115	24	23	14	6	10	19	28	16	23	9	29	5	4	15	16	5	5	24	17	13
116	24	25	24	2	7	16	28	12	15	10	18	13	20	3	5	24	17	13	1	10
117	6	16	18	3	13	1	22	6	20	20	18	8	25	28	8	13	23	5	25	25
118	4	21	21	13	19	23	8	23	16	18	7	22	12	24	4	13	12	15	14	14
119	29	4	21	13	19	23	8	23	16	18	7	22	12	24	4	13	12	15	14	14
120	15	16	20	23	20	17	21	3	13	16	11	6	19	10	25	13	3	24	3	23