

Документ подписан простой электронной подписью

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Министерство Транспорта РФ

Филиал ФГОУ ВПО «Морская государственная академия имени

адмирала Ф.Ф. Ушакова» в г. Ростове-на-Дону

Дифференциальные уравнения

Типовое расчетное задание

Ростов-на-Дону

Задание 1.

Найти решение задачи Коши.

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

Задание 2.

Найти общий интеграл дифференциального уравнения.

1. $4xdx - 3y \cdot dy = 3x^2 ydy - 2xy^2 dx$

2. $x \cdot \sqrt{1+y^2} + y \cdot y' \cdot \sqrt{1+x^2} = 0$

3. $\sqrt{4+y^2} dx - ydy = x^2 \cdot ydy$

4. $\sqrt{3+y^2} \cdot dx - ydy = x^2 ydy$

5. $6x \cdot dx - 6y \cdot dy = 2x^2 ydy - 3xy^2 dx$

6. $x \cdot \sqrt{3+y^2} dx + y\sqrt{2+x^2} \cdot dy = 0$

7. $(e^{2x} + 5) \cdot dy + y \cdot e^{2x} \cdot dx = 0$

8. $y' \cdot y \cdot \sqrt{\frac{1-x^2}{1-y^2}} + 1 = 0$

9. $6xdx - 6ydy = 3x^2 ydy - 2xy^2 dx$

10. $x \cdot \sqrt{5+y^2} dx + y \cdot \sqrt{4+x^2} dy = 0$

11. $y \cdot (4 + e^x) dy - e^x \cdot dx = 0$

12. $\sqrt{4-x^2} \cdot y' + xy^2 + x = 0$

13. $2x \cdot dx - 2ydy = x^2 \cdot ydy - 2xy^2 dx$

14. $x \cdot \sqrt{4+y^2} dx + y \cdot \sqrt{1+x^2} dy = 0$

15. $(e^x + 8)dy - y \cdot e^x \cdot dx = 0$

16. $\sqrt{5+y^2} + y \cdot y' \cdot \sqrt{1-x^2} = 0$

17. $6xdx - ydy = yx^2 dy - 3xy^2 dx$

18. $y \cdot \ln y + xy' = 0$

19. $(1 + e^x) \cdot y' = y \cdot e^x$

20. $\sqrt{1-x^2} \cdot y' + xy^2 + x = 0$

21. $6x \cdot dx - 2ydy = 2yx^2 dy - 3xy^2 dx$

22. $y(1 + \ln y) + xy' = 0$

23. $(3 + e^x)y \cdot y' = e^x$

24. $\sqrt{3+y^2} + \sqrt{1-x^2} \cdot y \cdot y' = 0$

25. $xdx - ydy = yx^2 dx - xy^2 dx$

26. $\sqrt{5+y^2} dx + 4(x^2 y + y)dy = 0$

27. $(1 + e^x)y \cdot y' = e^x$

28. $3(x^2 y + y)dy + \sqrt{2+y^2} dx = 0$

29. $2xdx - ydy = y \cdot x^2 dy - xy^2 dx$

30. $2x + 2xy^2 + \sqrt{2-x^2} \cdot y' = 0$

Задание 3.

Найти решение задачи Коши:

1. $(x^2 + 2y^2)dx - x^2 dy = 0, \quad y(1) = \frac{\sqrt{7}}{4}$

2. $(y^2 - 2xy)dx + x^2 dy = 0, \quad y(1) = 0$

3. $y^2 + x^2 \cdot y' = xy \cdot y'$, $y(1) = 1$
4. $xy' - y = x \cdot \operatorname{tg} \frac{y}{x}$, $y(1) = \frac{\pi}{6}$
5. $xy' - y = (x + y) \cdot \ln \frac{x + y}{x}$, $y(1) = 0$
6. $(y + \sqrt{xy})dx = xdy$, $y(1) = 0$
7. $(x - y \cdot \cos \frac{y}{x})dx + x \cdot \cos \frac{y}{x} dy = 0$, $y(1) = 0$
8. $(3x^2 + 2xy - y^2)dx + (x^2 - 2xy - 3y^2)dy = 0$, $y(1) = 1$
9. $(y^2 - 3x^2)dy + 2xydx = 0$, $y(1) = 0$
10. $(x \cdot \cos \frac{y}{x} + y \cdot \sin \frac{y}{x})ydx = (y \cdot \sin \frac{y}{x} - x \cdot \cos \frac{y}{x})xdy$, $y(1) = 1$
11. $xdy = (y + \sqrt{x^2 + y^2})dx$, $y(1) = 0$
12. $xydy = \left[(x + y)^2 \cdot e^{-\frac{y}{x}} + y^2 \right] dx$, $y(1) = 0$
13. $ydx + (2\sqrt{xy} - x)dy = 0$, $y(1) = 1$
14. $y(y - xy') = \sqrt{x^4 + y^4}$, $y(1) = 0$
15. $x^2(dy - dx) = (x + y) \cdot ydx$, $y(1) = 0$
16. $y' \cdot \sqrt{x} = \sqrt{y - x} + \sqrt{x}$, $y(1) = 1$
17. $xy' \cdot (\ln y - \ln x) = y$, $y(1) = 1$
18. $(xy \cdot e^{\frac{x}{y}} + y^2)dx = x^2 \cdot e^{\frac{x}{y}} dy$, $y(1) = 1$
19. $xy' = y \cdot (1 + \ln \frac{y}{x})$, $y(1) = 1$
20. $\frac{y - xy'}{x + y \cdot y'} = 2$, $y(1) = 0$
21. $(2x^2 - y^2)dx = y^2 dy$, $y(1) = 0$
22. $x^2 \cdot dy - (x^2 + 2xy)dx = 0$, $y(1) = 0$
23. $(2y - \sqrt{xy})dx = xdy$, $y(1) = 0$
24. $x \cdot \sin \frac{y}{x} dy = (y \cdot \sin \frac{y}{x} - x)dx$, $y(1) = 0$
25. $xdy = (2y - \sqrt{x^2 + y^2})dx$, $y(1) = 0$
26. $y' \cdot \sqrt{x} = \sqrt{y + x} - \sqrt{x}$, $y(1) = 0$
27. $xy' - y = x \cdot e^{\frac{y}{x}}$, $y(1) = 0$
28. $(y - 3\sqrt{xy})dx = xdy$, $y(1) = 0$
29. $xy' = y + \frac{x}{\ln \frac{y}{x}}$, $y(1) = 1$
30. $y' \cdot \sqrt{x} = \sqrt{y - 3x} + 3\sqrt{x}$, $y(1) = 4$

Задание 4.

Найти общий интеграл уравнения:

1. $y' = \frac{y^2}{x^2} + 4\frac{y}{x} + 2$

2. $xy' = \frac{3y^3 + 2yx^2}{2y^2 + x^2}$

3. $y' = \frac{x + y}{x - y}$

4. $xy' = \sqrt{x^2 + y^2} + y$

5. $2y' = \frac{y^2}{x^2} + 6\frac{y}{x} + 3$

6. $xy' = \frac{3y^3 + 4yx^2}{2y^2 + 2x^2}$

7. $y' = \frac{x + 2y}{2x - y}$

8. $xy' = 2\sqrt{x^2 + y^2} + y$

9. $3y' = \frac{y^2}{x^2} + 8\frac{y}{x} + 4$

10. $xy' = \frac{3y^3 + 6yx^2}{2y^2 + 3x^2}$

11. $y' = \frac{x^2 + xy - y^2}{x^2 - 2xy}$

12. $xy' = \sqrt{2x^2 + y^2} + y$

13. $y' = \frac{y^2}{x^2} + 6\frac{y}{x} + 6$

14. $xy' = \frac{3y^3 + 8yx^2}{2y^2 + 4x^2}$

15. $y' = \frac{x^2 + 2xy - y^2}{2x^2 - 2xy}$

16. $xy' = 3\sqrt{x^2 + y^2} + y$

17. $2y' = \frac{y^2}{x^2} + 8\frac{y}{x} + 8$

18. $xy' = \frac{3y^3 + 10yx^2}{2y^2 + 5x^2}$

19. $y' = \frac{x^2 + 3xy - y^2}{3x^2 - 2xy}$

20. $xy' = 3\sqrt{2x^2 + y^2} + y$

21. $y' = \frac{y^2}{x^2} + 8\frac{y}{x} + 12$

22. $xy' = \frac{3y^3 + 12yx^2}{2y^2 + 6x^2}$

$$23. y' = \frac{x^2 + xy - 3y^2}{x^2 - 4xy}$$

$$24. xy' = 2\sqrt{3x^2 + y^2} + y$$

$$25. 4y' = \frac{y^2}{x^2} + 10\frac{y}{x} + 5$$

$$26. xy' = \frac{3y^3 + 14yx^2}{2y^2 + 7x^2}$$

$$27. y' = \frac{x^2 + xy - 5y^2}{x^2 - 6xy}$$

$$28. xy' = 4\sqrt{x^2 + y^2} + y$$

$$29. 3y' = \frac{y^2}{x^2} + 10\frac{y}{x} + 10$$

$$30. xy' = 4\sqrt{2x^2 + y^2} + y$$

Задание 5.

Найти решение задачи Коши.

$$1. y' - \frac{y}{x} = x^2; \quad y(1) = 0$$

$$2. y' - y \operatorname{ctg} x = 2x \cdot \sin x, \quad y\left(\frac{\pi}{2}\right) = 0$$

$$3. y' + y \cos x = \frac{1}{2} \sin 2x, \quad y(0) = 0$$

$$4. y' + y \operatorname{tg} x = \cos^2 x, \quad y\left(\frac{\pi}{4}\right) = \frac{1}{2}$$

$$5. y' - \frac{y}{x+2} = x^2 + 2x; \quad y(-1) = \frac{3}{2}$$

$$6. y' - \frac{y}{x+1} = e^x \cdot (x+1), \quad y(0) = 1$$

$$7. y' - \frac{y}{x} = x \sin x; \quad y\left(\frac{\pi}{2}\right) = 1$$

$$8. y' + \frac{y}{x} = \sin x, \quad y(\pi) = \frac{1}{\pi}$$

$$9. y' + \frac{y}{2x} = x^2, \quad y(1) = 1$$

$$10. y' + \frac{2x}{1+x^2} \cdot y = \frac{2x^2}{1+x^2}; \quad y(0) = \frac{2}{3}$$

$$11. y' - \frac{2x-5}{x^2} y = 5, \quad y(2) = 4$$

$$12. y' + \frac{y}{x} = \frac{x+1}{x} \cdot e^x, \quad y(1) = e$$

$$13. y' - \frac{y}{x} = -2 \cdot \frac{\ln x}{x}, \quad y(1) = 1$$

$$14. y' - \frac{y}{x} = -\frac{12}{x^3}, \quad y(1) = 4$$

15. $y' + \frac{2}{x}y = x^3, \quad y(1) = -\frac{5}{6}$
16. $y' + \frac{y}{x} = 3x, \quad y(1) = 1$
17. $y' - \frac{2xy}{1+x^2} = 1+x^2, \quad y(1) = 3$
18. $y' + \frac{1-2x}{x^2}y = 1, \quad y(1) = 1$
19. $y' + \frac{3y}{x} = \frac{2}{x^3}, \quad y(1) = 1$
20. $y' + 2xy = -2x^3, \quad y(1) = \frac{1}{e}$
21. $y' + \frac{xy}{2(1-x^2)} = \frac{x}{2}, \quad y(0) = \frac{2}{3}$
22. $y' + xy = -x^3, \quad y(0) = 3$
23. $y' - \frac{2}{x+1}y = e^x \cdot (x+1)^2, \quad y(0) = 1$
24. $y' + 2xy = x \cdot e^{-x^2} \cdot \sin x, \quad y(0) = 1$
25. $y' - \frac{2y}{x+1} = (x+1)^3, \quad y(0) = \frac{1}{2}$
26. $y' - y \cos x = -\sin 2x, \quad y(0) = 3$
27. $y' - 2xy = -4x^3, \quad y(0) = -\frac{1}{2}$
28. $y' - \frac{y}{x} = -\frac{\ln x}{x}, \quad y(1) = 1$
29. $y' - 3x^2y = \frac{x^2 \cdot (1+x^3)}{3}, \quad y(0) = 0$
30. $y' - y \cos x = \sin 2x, \quad y(0) = -1$

Задание 6

Найти общее решение уравнения

1. $xy' = 2y + 2x^4$
2. $(2x+1)y' = 4x + 2y$
3. $(xy + e^x)dx = xdy$
4. $x^2y' + xy + 1 = 0$
5. $y + x(y' - x \cos x)$
6. $2x(x^2 + y)dx = dy$
7. $(xy' - 1) \ln x = 2y$
8. $xy' + (x+1)y = 3x^2 \cdot e^{-x}$
9. $(x + y^2)dy = ydx$
10. $(2e^y - x)y' = 1$
11. $(2x + y)dy = ydx + 4 \ln y dy$
12. $(\sin^2 y + x \operatorname{ctg} y)dy = dx$
13. $xy' + x^2 + xy - y = 0$

14. $y + y' \cdot \ln^2 y = (x + 2 \ln y) \cdot y'$
15. $x(x-1)y' + 2xy = 1$
16. $x(x+1)(y'-1) = y$
17. $(2xe^y + y^4)y' = ye^y$
18. $3x^2 - y = y' \cdot \sqrt{x^2 + 1}$
19. $y' = \frac{1}{x - y^2}$
20. $2(x - y^2)dy = ydx$
21. $(1 + x^2)y' - 2xy = (1 + x^2)^2$
22. $y' + 2xy = 2x \cdot e^{-x^2}$
23. $y' + \frac{3}{x}y = \frac{2}{x^3}$
24. $y' = \frac{1}{2x + y^2}$
25. $(1 - x^2)y' - xy = 1$
26. $(x^2 - 1)y' - xy = x^3 - x$
27. $xy' + y - 3 = 0$
28. $y' - 3x^2y - x^2 = 0$
29. $y' \cdot \cos x = y \sin x + \cos x$
30. $dx = (e^y - 3x)dy$

Задание 7

Решить задачу Коши.

1. $y^2 dx + (x + e^{2/y})dy = 0, \quad y(e) = 2$
2. $(y^4 \cdot e^y + 2x)y' = y, \quad y(0) = 1$
3. $y^2 dx + (xy - 1)dy = 0, \quad y(1) = e$
4. $2(4y^2 + 4y - x)y' = 1, \quad y(0) = 0$
5. $(\cos 2y \cdot \cos^2 y - x)y' = \sin y \cdot \cos y, \quad y\left(\frac{1}{4}\right) = \frac{\pi}{3}$
6. $(x \cdot \cos^2 y - y^2)y' = y \cos^2 y, \quad y(\pi) = \frac{\pi}{4}$
7. $e^{y^2} \cdot (dx - 2xydy) = ydy, \quad y(0) = 0$
8. $(104y^3 - x)y' = 4y, \quad y(8) = 1$
9. $dx + (xy - y^3)dy = 0, \quad y(-1) = 0$
10. $(3y \cos 2y - 2y^2 \sin 2y - 2x)y' = y, \quad y(16) = \frac{\pi}{4}$
11. $8(4y^3 + xy - y)y' = 1, \quad y(0) = 0$
12. $(2 \ln y - \ln^2 y)dy = ydx - xdy, \quad y(4) = e^2$
13. $2(x + y^4)y' = y, \quad y(-2) = -1$
14. $y^3 \cdot (y-1)dx + 3xy^2(y-1)dy = (y+2)dy, \quad y\left(\frac{1}{4}\right) = 2$
15. $2y^2 dx + (x + e^{\frac{1}{y}})dy = 0, \quad y(e) = 1$

16. $(xy + \sqrt{y})dy + y^2 dx = 0, \quad y(-\frac{1}{2}) = 4$
17. $\sin 2y dx = (\sin^2 2y - 2\sin^2 y + 2x)dy, \quad y(-\frac{1}{2}) = \frac{\pi}{4}$
18. $(y^2 + 2y - x)y' = 1, \quad y(2) = 0$
19. $2y\sqrt{y} dx - (6x\sqrt{y} + 7)dy = 0, \quad y(-4) = 1$
20. $dx = (\sin y + 3\cos y + 3x)dy, \quad y(\frac{\pi}{2}) = \frac{\pi}{2}$
21. $2(\cos^2 y \cdot \cos 2y - x)y' = \sin 2y, \quad y(\frac{3}{2}) = \frac{5\pi}{4}$
22. $chy \cdot dx = (1 + x \cdot shy)dy, \quad y(1) = \ln 2$
23. $(13y^3 - x)y' = 4y, \quad y(5) = 1$
24. $y^2(y^2 + 4)dx + 2xy(y^2 + 4)dy = 2dy, \quad y(\frac{\pi}{8}) = 2$
25. $(x + \ln^2 y - \ln y)y' = \frac{y}{2}, \quad y(2) = 1$
26. $(2xy + \sqrt{y})dy + 2y^2 dx = 0, \quad y(-\frac{1}{2}) = 1$
27. $y dx + (2x - 2\sin^2 y - y \sin 2y)dy = 0, \quad y(\frac{3}{2}) = \frac{\pi}{4}$
28. $2(y^3 - y + xy)dy = dx, \quad y(-2) = 0$
29. $(2y + xtgy - y^2 tgy)dy = dx, \quad y(0) = \pi$
30. $4y^2 dx + (e^{\frac{1}{2y}} + x)dy, \quad y(e) = \frac{1}{2}$

Задание 8.

Найти решение задачи Коши.

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

14. $3(xy'+y) = xy^2, \quad y(1) = 3$
15. $y'-y = 2xy^2, \quad y(0) = \frac{1}{2}$
16. $2xy'-3y = -(20x^2 + 12)y^3, \quad y(1) = \frac{1}{2\sqrt{2}}$
17. $y'+2xy = 2x^3y^3, \quad y(0) = \sqrt{2}$
18. $xy'+y = y^2 \cdot \ln x, \quad y(1) = 1$
19. $2y'+3y \cos x = (8 + 12 \cos x) \cdot e^{2x} \cdot \frac{1}{y}, \quad y(0) = 2$
20. $4y'+x^3y = (x^3 + 8) \cdot e^{-2x} \cdot y^2, \quad y(0) = 1$
21. $8xy'-12y = -(5x^2 + 3)y^3, \quad y(1) = \sqrt{2}$
22. $2(y'+y) = xy^2, \quad y(0) = 2$
23. $y'+xy = (x-1) \cdot e^x \cdot y^2, \quad y(0) = 1$
24. $2y'-3y \cos x = -e^{-2x} \cdot (2 + 3 \cos x) \cdot \frac{1}{y}, \quad y(0) = 1$
25. $y'-y = xy^2, \quad y(0) = 1$
26. $2(xy'+y) = y^2 \cdot \ln x, \quad y(1) = 2$
27. $y'+y = xy^2, \quad y(0) = 1$
28. $y'+2y \operatorname{cthx} = y^2 \cdot \operatorname{chx}, \quad y(1) = \frac{1}{\operatorname{sh} 1}$
29. $2(y'+xy) = (x-1)e^x \cdot y^2, \quad y(0) = 2$
30. $y'-y \operatorname{tgx} = -\frac{2}{3} \cdot y^4 \cdot \sin x, \quad y(0) = 1$

Задание 9.

Найти решение задачи Коши.

1. $x^2 \cdot y'' = (y')^2, \quad y(1) = -\ln 2, \quad y'(1) = 0,5$
2. $y'' \cdot (e^x + 1) + y' = 0, \quad y(0) = 0, \quad y'(0) = 2$
3. $2xy' \cdot y'' = (y')^2 - 1, \quad y(1) = \frac{16}{3}, \quad y'(1) = 2$
4. $(1 + x^2)y'' + (y')^2 + 1 = 0, \quad y(0) = 1, \quad y'(0) = 0$
5. $xy'' = y' \cdot \ln\left(\frac{y'}{x}\right), \quad y(1) = 0, \quad y'(1) = e^2$
6. $x^3 \cdot y'' + x^2 \cdot y' = 1, \quad y(1) = 1, \quad y'(1) = 0$
7. $y'' + y' \operatorname{tgx} = \sin 2x, \quad y(0) = 0, \quad y'(0) = -2$
8. $y'' \cdot x \cdot \ln x = y', \quad y(2) = -2, \quad y'(2) = \ln 2$
9. $2xy'' = y', \quad y(0) = 0, \quad y'(0) = 0$
10. $y'' \cdot \operatorname{tgx} = y' + 1, \quad y\left(\frac{\pi}{2}\right) = 0, \quad y'\left(\frac{\pi}{2}\right) = 0$
11. $y'' - 2y' \operatorname{ctgx} = \sin^3 x, \quad y\left(\frac{\pi}{2}\right) = 0, \quad y'\left(\frac{\pi}{2}\right) = 0$
12. $xy'' + 2y' = x^3, \quad y(1) = 0, \quad y'(1) = 0,2$
13. $y'' + \frac{1}{x}y' = x^5, \quad y(1) = \frac{1}{49}, \quad y'(1) = \frac{1}{7}$

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

Задание 10

Найти общее решение уравнения:

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

16. $xy'' = y' \left(1 + \ln \frac{y'}{x}\right)$
17. $y'' + y' \operatorname{tg} x = \cos x$
18. $xy'' - y' - \sqrt{xy'} = 0$
19. $y'' = \frac{y'}{x} + \sin \frac{y'}{x}$
20. $xy'' - y' = x \cdot \operatorname{tg} \frac{y'}{x}$
21. $x^2 + (y')^2 - 2xy'y'' = 0$
22. $xy'' + y' = 4x^3$
23. $y' - xy' = y' \ln \frac{x}{y'}$
24. $xy'' - y' = x^2 \cdot \cos x$
25. $y'' - y' = e^x$
26. $y'' + y' = x\sqrt{y}$
27. $y'' + y' \cos x = \sin 2x$
28. $\operatorname{tg} x \cdot y'' - y' + \frac{1}{\sin x} = 0$
29. $(1 + x^2)y'' + 2xy' = x^3$
30. $x^2y'' + xy' = 1$

Задание 11

Найти решение задачи Коши.

1. $4y^3y'' = y^4 - 1; y(0) = \sqrt{2}, y'(0) = \frac{1}{2\sqrt{2}}$
2. $y'' - 128y^3, y(0) = 1, y'(0) = 8$
3. $y'' \cdot y^3 + 64 = 0, y(0) = 4, y'(0) = 2$
4. $y'' + 2\sin y \cdot \cos^3 y = 0, y(0) = 0, y'(0) = 1$
5. $y'' = 32\sin^3 y \cos y, y(1) = \frac{\pi}{2}, y'(1) = 4$
6. $y'' = 98y^3, y(1) = 1, y'(1) = 7$
7. $y''y^3 + 49 = 0, y(3) = -7, y'(3) = -1$
8. $4y^3y'' = 16y^4 - 1, y(0) = \frac{\sqrt{2}}{2}, y'(0) = \frac{1}{\sqrt{2}}$
9. $y'' + 8\sin y \cos^3 y = 0, y(0) = 0, y'(0) = 2$
10. $y'' = 72y^3, y(2) = 1, y'(2) = 6$
11. $y'' \cdot y^3 + 36 = 0, y(0) = 3, y'(0) = 2$
12. $y'' = 18\sin^3 y \cos y, y(1) = \frac{\pi}{2}, y'(1) = 3$
13. $4y^3y'' = y^4 - 16, y(0) = 2\sqrt{2}, y'(0) = \frac{1}{\sqrt{2}}$
14. $y'' = 50y^3, y(3) = 1, y'(3) = 5$
15. $y''y^3 + 25 = 0, y(2) = -5, y'(2) = -1$
16. $y'' 18\sin y \cos^3 y = 0, y(0) = 0, y'(0) = 3$
17. $y'' = 8\sin^3 y \cos y, y(1) = \frac{\pi}{2}, y'(1) = 2$
18. $y'' = 32y^3, y(4) = 1, y'(4) = 4$

19. $y''y^3 + 16 = 0, y(1) = 2, y'(1) = 2$
20. $y'' + 32\sin y \cos^3 y = 0, y(0) = 0, y'(0) = 4$
21. $y'' = 50\sin^3 \cos y, y(1) = \frac{\pi}{2}, y'(1) = 5$
22. $y'' = 18y^3, y(1) = 1, y'(1) = 3$
23. $y''y^3 + 9 = 0, y(1) = 1, y'(1) = 3$
24. $y^3y'' = 4(y^4 - 1), y(0) = \sqrt{2}, y'(0) = \sqrt{2}$
25. $y'' + 50\sin y \cos^3 y = 0, y(0) = 0, y'(0) = 5$
26. $y'' = 8y^3, y(0) = 1, y'(0) = 2$
27. $y''y^3 + 4 = 0, y(0) = -1, y'(0) = -2$
28. $y'' = 2\sin^3 \cos y, y(1) = \frac{\pi}{2}, y'(1) = 1$
29. $y^3y'' = y^4 - 16, y(0) = 2\sqrt{2}, y'(0) = \sqrt{2}$
30. $y^3y'' = 4(y^4 - 1), y(0) = \sqrt{2}, y'(0) = \sqrt{2}$

Задние 12

Найти общий интеграл уравнения

1. $yy'' = y^2y' + (y')^2$
2. $y'' = (y')^2 + y'(y - 1) = 0$
3. $yy' + (y')^2 + yy'' = 0$
4. $y'' \operatorname{tg} y = (y')^2$
5. $y'' + \frac{1}{y^2} \cdot e^{y^2} \cdot y' - 2y(y')^2 = 0$
6. $y'' = \sqrt{1 - (y')^2}$
7. $y'' - (y')^2 = 2y' \cdot e^y$
8. $yy'' = (y')^3 - (y')^2$
9. $yy'' = (y')^2$
10. $y'' - \frac{3(y')^2}{y} = 3 \frac{y'}{y}$
11. $3(y')^2 = 4yy'' + y^2$
12. $2y(y')^3 + y'' = 0$
13. $1 + (y')^2 = 2yy''$
14. $yy'' - 2yy' \ln y = (y')^2$
15. $yy'' - 3(y')^2 = -2yy''$
16. $y'' \cos y + (y')^2 \sin y = y' \sin y$
17. $y'' + (y')^2 = y'$
18. $yy'' - (y')^2 = y^2y'$
19. $2yy'' - 3(y')^2 = -4y^2$
20. $(y - 2)y'' = 2(y')^2$
21. $2yy'' + y^2 - (y')^2 = 0$
22. $yy'' - y'(2\sqrt{yy'} - y')$
23. $2yy'' = 3 + (y')^2$

$$24. y'' = y' \left(\frac{y'}{y} - 2\sqrt{\frac{y'}{y} - 4} \right)$$

$$25. y'' = 3\sqrt{y+1}$$

$$26. (y+1)^2 y'' = (y')^3$$

$$27. y'' y + (y')^2 = -y^2 y'$$

$$28. y'(1 + (y')^2) = y''$$

$$29. y'' = 2e^y$$

$$30. (y' + 2y)y'' = (y')^2$$

Задние 13

Найти решение задачи Коши

$$1. y'' - 5y' + 6y = 2\cos x, y(0) = 3, y'(0) = \frac{1}{2}$$

$$2. y'' - 2y' + 5y = x^2 + 1, y(0) = -3, y'(0) = -\frac{1}{5}$$

$$3. y'' - 4y' + 4y = -x^2 + 3x, y(0) = 3, y'(0) = \frac{4}{3}$$

$$4. y'' - 2y' + 10y = -\sin 2x, y(0) = 0, y'(0) = \frac{3}{4}$$

$$5. y'' - 4y' + 3y = e^{5x}, y(0) = , y'(0) = 9$$

$$6. y'' + 4y = \sin 2x + 1, y(0) = \frac{1}{4}, y'(0) = 0$$

$$7. y'' + y' = e^{-x}, y(0) = 1, y'(0) = 1$$

$$8. y'' - 6y' + 9y = 9x^2 - 12x + 2, y(0) = 1, y'(0) = 3$$

$$9. y'' + 9y = 36e^{3x}, y(0) = 0, y'(0) = 0$$

$$10. y'' + 2y' - 8y = 3\sin x, y(0) = -1, y'(0) = -\frac{3}{2}$$

$$11. y'' + 6y' + 13y = 8e^{-x}, y(0) = \frac{3}{2}, y'(0) = 2$$

$$12. y'' - 4y' + 8y = 8x^2 + 4, y(0) = 2, y'(0) = 3$$

$$13. y'' + y' - 5y = 50\cos x, y(0) = 3, y'(0) = 5$$

$$14. y'' + 2y' + 5y = 13e^{2x} + 1, y(0) = 1, y'(0) = 4$$

$$15. y'' - 4y' + 5y = 10x, y(0) = 10, y'(0) = 6$$

$$16. y'' - 4y' + 4y = 3x - x^2, y(0) = 3, y'(0) = \frac{4}{3}$$

$$17. y'' - 6y' + 9y = 4e^x, y(0) = 3, y'(0) = 8$$

$$18. y'' - 4y' + 4y = -169\sin 3x, y(0) = -12, y'(0) = 16$$

$$19. y'' + 2y' - 8y = 16x + 4, y(0) = 2, y'(0) = 6$$

$$20. y'' - 4y' + 5y = 5x^2 - 4, y(0) = \frac{2}{25}, y'(0) = \frac{3}{5}$$

$$21. y'' - 4y' + 5y = xe^{2x}, y(0) = 1, y'(0) = 0$$

$$22. y'' - 4y' + 4y = e^{2x}, y(0) = 2, y'(0) = 8$$

$$23. y'' - 5y' + 6y = (12x - 7)e^{-x} + 1, y(0) = 0, y'(0) = 0$$

$$24. y'' - y' = 5x^2, y(0) = 0, y'(0) = 0$$

$$25. y'' + 5y' + 6y = 12\cos 2x - 8\sin 2x, y(0) = 1, y'(0) = 3$$

$$26. y'' + y = 2\cos x, y(0) = 1, y'(0) = 0$$

$$27. y'' + 6y' + 9y = 10\sin x, y(0) = 0, y'(0) = 0$$

28. $y'' + 4y = e^{-2x}$, $y(0) = 0$, $y'(0) = 0$
 29. $y'' - 4y' + 5y = 2x^2e^x$, $y(0) = 2$, $y'(0) = 3$
 30. $y'' + 6y' + 13y = 26x - 1$, $y(0) = 0$, $y'(0) = 1$

Задание 14

Найти общее решение уравнения

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

Задание 15

Найти решение задачи Коши

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

Задание 16

Найти общее решение уравнения

1. $y'' - 4y' + 4y = x^2 \cdot \ln x \cdot e^{2x}$

2. $y'' + 2y' + y = \frac{x \cdot e^{-x}}{x+1}$

3. $y'' + 4y' + 4y = \operatorname{tg}^2 \cdot e^{-2x}$

4. $y'' - 2y' + y = \frac{x \cdot e^x}{\sqrt{1-x^2}}$

5. $y'' + 6y' + 9y = \sqrt{x+5} \cdot e^{-3x}$

6. $y'' - 2y' + y = \frac{e^x}{\sqrt{1+x}}$

7. $y'' + 4y' + 4y = \frac{\ln x}{x} e^{-2x}$

8. $y'' - 6y' + 9y = \frac{e^{3x}}{x+1}$

9. $y'' + 8y' + 16y = \frac{e^{-4x}}{\sqrt{1-x^2}}$

10. $y'' + y' + \frac{1}{4}y = \sqrt[3]{x+1} \cdot e^{-\frac{x}{2}}$

11. $y'' + 4y' + 4y = \sqrt{1-x^2} \cdot e^{-2x}$

12. $y'' + 2y' + y = \operatorname{arctg} x \cdot e^{-x}$

13. $y'' + \frac{1}{4}y = \frac{1}{\cos^2 \frac{x}{2}}$

14. $y'' + 9y = \frac{1}{\sin 3x}$

15. $y'' + y = \operatorname{tg} x$

16. $y'' + 4y = \operatorname{ctg} 2x$

17. $y'' + 2y = \frac{1}{\sin^2 \sqrt{2}x}$

18. $y'' + 16y = \frac{1}{\cos^2 4x}$

19. $y'' + y = \frac{1}{\cos^5 x}$

20. $y'' + 4y = \frac{1}{\sin^5 2x}$

21. $y'' + 3y' + 2y = \frac{e^{-x}}{1+e^{2x}}$

22. $y'' - 7y' + 12y = e^{5x} \operatorname{sine}^x$

23. $y'' - 5y' + 6y = e^{4x} \operatorname{tg}^2 e^x$

24. $y'' - 3y' + 2y = e^{3x} \sqrt{1-e^{2x}}$

25. $y'' - 9y' + 2y = 0 \frac{e^{6x}}{\sqrt{1+e^x}}$

26. $y'' - 5y' + 6y = e^{5x} \operatorname{arctg} e^x$

27. $y'' - y' = \frac{1}{1+e^x}$

28. $y'' - 5y' + 6y = \frac{e^{4x}}{\sqrt{1-e^{2x}}}$

29. $y'' - 3y' + 2y = \frac{e^{4x}}{\sqrt{1-e^{2x}}}$

30. $y'' - 2y' + y = e^x \ln x$

Задание 17.

Решить задачу Коши.

1.
$$\begin{cases} x' = y & x(0) = 1 \\ y' = x + t^2 & y(0) = 2 \end{cases}$$
2.
$$\begin{cases} x' = y - 5 \cos t & x(0) = 0 \\ y' = 2x + y & y(0) = 1 \end{cases}$$
3.
$$\begin{cases} x' = 3x + 2y + 4e^{5t} & x(0) = -1 \\ y' = x + 2y & y(0) = 1 \end{cases}$$
4.
$$\begin{cases} x' = -x + 2y + 1 & x(0) = 3 \\ y' = -2x + 3y & y(0) = -2 \end{cases}$$
5.
$$\begin{cases} x' = x + 2y & x(0) = 0 \\ y' = x - 5 \sin t & y(0) = 1 \end{cases}$$
6.
$$\begin{cases} x' = 2x - y & x(0) = 1 \\ y' = -2x + y + 18t & y(0) = 2 \end{cases}$$
7.
$$\begin{cases} x' = 3x - 4y + e^{-2t} & x(0) = -3 \\ y' = x - 2y - 3e^{-2t} & y(0) = 1 \end{cases}$$
8.
$$\begin{cases} x' = 2x - 3y & x(0) = -2 \\ y' = x - 2y + 2 \sin t & y(0) = 1 \end{cases}$$
9.
$$\begin{cases} x' = x - y + 8t & x(0) = \frac{1}{2} \\ y' = 5x - y & y(0) = 1 \end{cases}$$
10.
$$\begin{cases} x' = 5x - 3y & x(0) = 0 \\ y' = x + y + 5e^{-t} & y(0) = -1 \end{cases}$$
11.
$$\begin{cases} x' = 2x + 4y - 8 & x(0) = 2 \\ y' = 3x + 6y & y(0) = -1 \end{cases}$$
12.
$$\begin{cases} x' = 4x - 3y + \sin t & x(0) = 1 \\ y' = 2x - y - 2 \cos t & y(0) = 0 \end{cases}$$

$$13. \begin{cases} x' = x + y + 1 & x(0) = -1 \\ y' = 3x - y + 2t & y(0) = -2 \end{cases}$$

$$14. \begin{cases} x' = 2x + y + \cos t & x(0) = -3 \\ y' = -x + 2 \sin t & y(0) = 1 \end{cases}$$

$$15. \begin{cases} x' = 2x - y + 2e^t & x(0) = 2 \\ y' = 3x - 2y + 4e^t & y(0) = -1 \end{cases}$$

$$16. \begin{cases} x' = x - 2y + 7 & x(0) = 1 \\ y' = x - y + 4 & y(0) = -4 \end{cases}$$

$$17. \begin{cases} x' = 4x + 6y & x(0) = -\frac{1}{2} \\ y' = 2x + 3y + t & y(0) = \frac{3}{2} \end{cases}$$

$$18. \begin{cases} x' = 4x + y - e^{2t} & x(0) = \frac{\pi}{6} \\ y' = -2x + y & y(0) = 0 \end{cases}$$

$$19. \begin{cases} x' = y & x(0) = -3 \\ y' = x + e^{-t} & y(0) = 2 \end{cases}$$

$$20. \begin{cases} x' = -2y + 3t & x(0) = 1 \\ y' = 2x + 4 & y(0) = -3 \end{cases}$$

$$21. \begin{cases} x' = x + y - \cos 2t & x(0) = 3 \\ y' = 3x - y + 3 \sin 2t & y(0) = 2 \end{cases}$$

$$22. \begin{cases} x' = -y + e^{3t} & x(0) = -1 \\ y' = -x + 2e^{3t} & y(0) = -2 \end{cases}$$

$$23. \begin{cases} x' = x + 4y - t^2 & x(0) = -\frac{1}{2} \\ y' = x - 2y + 1 & y(0) = \frac{1}{2} \end{cases}$$

$$24. \begin{cases} x' = -x + y + 2 \sin t - 3 \cos t & x(0) = 0 \\ y' = -6x + 4y + 7 \sin t - 20 \cos t & y(0) = 1 \end{cases}$$

$$25. \begin{cases} x' = x + 4y + 4e^x & x(0) = 3 \\ y' = 2x + 3y + e^t & y(0) = -2 \end{cases}$$

$$26. \begin{cases} x' = -3x + 2y + 2\cos t & x(0) = 2 \\ y' = -3x + y & y(0) = 1 \end{cases}$$

$$27. \begin{cases} x' = x + 2y - 2t & x(0) = -\frac{5}{6} \\ y' = 3x + 2y + \frac{1}{2} & y(0) = \frac{1}{6} \end{cases}$$

$$28. \begin{cases} x' = x + y + e^{3t} & x(0) = 0 \\ y' = 12x + 2y + 9e^{3t} & y(0) = -1 \end{cases}$$

$$29. \begin{cases} x' = -3x - y + 4t & x(0) = 0 \\ y' = x - y - 4 & y(0) = 1 \end{cases}$$

$$30. \begin{cases} x' = 3x + y + 2\sin t & x(0) = -1 \\ y' = 8x + y - 8\sin t & y(0) = 3 \end{cases}$$

Задание 18.

Найти общее решение системы:

$$1. \begin{cases} x' = 3 - 2y + t^2 \\ y' = 2x - 2t \end{cases}$$

$$2. \begin{cases} x' = x + y + t \\ y' = -2x - 2y + 2t \end{cases}$$

$$3. \begin{cases} x' + y' = e^{-t} - y \\ 2x' + y' = \sin t - 2y \end{cases}$$

$$4. \begin{cases} x' + x = y + e^t \\ y' + y = x + e^t \end{cases}$$

$$5. \begin{cases} x' + y' = y + e^t \\ 2x' + y' + 2y = \cos t \end{cases}$$

$$6. \begin{cases} x' + 4y + 2x = 4t + 1 \\ y' + x - y = 1,5t^2 \end{cases}$$

$$7. \begin{cases} x' = 2x + 3y + 5e^t \\ y' = 3x + 2y + 8e^t \end{cases}$$

$$8. \begin{cases} 4x' - y' + 3x = \sin t \\ x' + y = \cos t \end{cases}$$

$$9. \begin{cases} x' + 2x + 2y = \sin t \\ y' - 4x - 2y = \cos t \end{cases}$$

$$10. \begin{cases} x' = 3 - 2y \\ y' = 2x - 2t \end{cases}$$

$$11. \begin{cases} x' = x - 2y + t \\ y' = x + 3y \end{cases}$$

$$12. \begin{cases} x' = 2x - 9y \\ y' = x + 8y + t^2 \end{cases}$$

$$13. \begin{cases} x' = e^t - y - 5x \\ y' = e^{2t} + x - 3y \end{cases}$$

$$14. \begin{cases} x' = 3x + 8y + 1 - 2t \\ y' = -3y - x \end{cases}$$

$$15. \begin{cases} x' = -4(x + y) + t \\ x' - 4y' = -4x + t \end{cases}$$

$$16. \begin{cases} x' = x + 5y + t \\ y' = -3y - x + 1 \end{cases}$$

$$17. \begin{cases} x' = y + 2e^t + t \\ y' = x + t^2 \end{cases}$$

$$18. \begin{cases} x' = y + t^2 \\ x' - y = x + y \end{cases}$$

$$19. \begin{cases} x' + x - 2y = 0 \\ y' + x + 4y = t \end{cases}$$

$$20. \begin{cases} x' = x + 2y + 1 \\ y' = 4x - y \end{cases}$$

$$21. \begin{cases} x' = -3x - 4y + t \\ y' = 2x + 3y \end{cases}$$

$$22. \begin{cases} x' = 3x + 5y + 2t \\ y' = 3x + y + 1 \end{cases}$$

$$23. \begin{cases} x' = 3 - 2y + t^2 \\ y' = 2x - 2t \end{cases}$$

$$24. \begin{cases} x' = x - 2y + t^2 \\ y' = x + 3y \end{cases}$$

$$25. \begin{cases} x' = 5x + 4y \\ y' = 2x + 3y \end{cases}$$

$$26. \begin{cases} x' = 2x + 8y \\ y' = x + 4y \end{cases}$$

$$27. \begin{cases} x' = x + 3y \\ y' = 3x + y \end{cases}$$

$$28. \begin{cases} x' = x + 5y \\ y' = 7x + 3y \end{cases}$$

$$29. \begin{cases} x' = 2x + 3y \\ y' = x + 4y \end{cases}$$

$$30. \begin{cases} x' = 5x + 8y \\ y' = 3x + 3y \end{cases}$$

Задание 19.

Построить последовательные приближения y_0, y_1, y_2 к решению данного уравнения с данными начальными условиями.

$$1. y' = x + x^2 y^2, \quad y(0) = 1$$

$$2. y' = x^2 - xy^3, \quad y(0) = 0$$

$$3. y' = 2x - x^2 y^2, \quad y(1) = 0$$

$$4. y' = x^2 + y^2 + 1, \quad y(1) = 1$$

$$5. y' = x^2 - y^2, \quad y(2) = 1$$

$$6. y' = xy + y^2, \quad y(0) = 1$$

$$7. y' = y^3 + x, \quad y(1) = 0$$

8. $y' = y + e^y \cdot x, \quad y(0) = 0$
9. $y' = y^2 + e^{y-1}, \quad y(0) = 1$
10. $y' = y^2 + x^2 \cdot e^y, \quad y(0) = 0$
11. $y' = 1 - x \cdot \sin y, \quad y(\pi) = 2\pi$
12. $y' = \frac{y}{\pi} + x \cdot \sin y, \quad y\left(\frac{\pi}{2}\right) = \pi$
13. $y' = (e^y - e) \sin x + \frac{y}{x}, \quad y(1) = 1$
14. $y' = \frac{1}{(1+x^2)} + \cos x \cdot \operatorname{tgy}, \quad y(0) = 0$
15. $y' = \frac{2x}{1+x^2} + e^{y+1} - 1, \quad y(0) = 1$
16. $y' = x^3 \cdot y + x^3 \cdot \sin \pi y, \quad y(0) = 1$
17. $y' = y^3 + x \cdot \cos 3y, \quad y(0) = 0$
18. $y' = \pi^2 - y^2 + x \cdot \sin \frac{y}{2}, \quad y(0) = \pi$
19. $y' = 1 + x \sin y, \quad y(2\pi) = \pi$
20. $y' = 1 - y^2 + x \cdot \cos \pi y, \quad y(1) = 1$
21. $y' = y^2 \cdot \sin x + (y-1)^2, \quad y\left(\frac{\pi}{2}\right) = 1$
22. $y' = (x-y)y^2 + 1, \quad y(1) = 0$
23. $y' = y^2 \cdot \sin x + \sin x, \quad y(0) = 0$
24. $y' = y^2 \cdot \sin x + \frac{y}{\cos^2 x} + \cos x, \quad y(0) = 0$
25. $y' = \sin x \cdot \ln y + y^3 \cdot e^x, \quad y(0) = 1$
26. $y' = x + y + y^2, \quad y(1) = 1$
27. $y' = \cos x + y^2, \quad y\left(\frac{\pi}{2}\right) = 0$
28. $y' = y^2 + \frac{1}{x}, \quad y(1) = 0$
29. $y' = y^3 + \sin x, \quad y\left(\frac{\pi}{2}\right) = 0$
30. $y' = (e^x - 1) \ln y + \frac{y}{e}, \quad y(1) = e$

Аннотация

Пособие содержит 19 заданий по 30 вариантов в каждом. Предназначено для организации индивидуальной самостоятельной работы курсантов по высшей математике. Задания различаются по уровню сложности и могут быть использованы для компоновки графо-расчетных заданий и курсовых работ по высшей математике, а также спецкурсу “Матпакеты”.