

## V. ДИФФЕРЕНЦИАЛЬНЫЕ УРАВНЕНИЯ

### Расчетные задания

**Задача 1.** Найти общий интеграл дифференциального уравнения. (Ответ представить в виде  $\psi(x, y) = C$ .)

1.1.  $4xdx - 3ydy = 3x^2ydy - 2xy^2dx.$

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

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

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

1.5.  $6xdx - 6ydy = 2x^2ydy - 3xy^2dx.$

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

1.7.  $(e^{2x} + 5)dy + ye^{2x}dx = 0.$

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

1.9.  $6xdx - 6ydy = 3x^2ydy - 2xy^2dx.$

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

1.11.  $y(4 + e^x)dy - e^x dx = 0.$

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

1.13.  $2xdx - 2ydy = x^2ydy - 2xy^2dx.$

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

1.15.  $(e^x + 8)dy - ye^x dx = 0.$

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

1.17.  $6xdx - ydy = yx^2dy - 3xy^2dx.$

1.18.  $y \ln y + xy' = 0.$

1.19.  $(1 + e^x)y' = ye^x.$

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

1.21.  $6xdx - 2ydy = 2yx^2dy - 3xy^2dx.$

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

1.23.  $(3 + e^x)yy' = e^x.$

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

1.25.  $xdx - ydy = yx^2dy - xy^2dx.$

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

1.27.  $(1 + e^x)yy' = e^x.$

1.28.  $3(x^2y + y)dy + \sqrt{2+y^2}dx = 0.$

1.29.  $2xdx - ydy = yx^2dy - xy^2dx.$

1.30.  $2x + 2xy^2 + \sqrt{2-x^2}y' = 0.$

1.31.  $20xdx - 3ydy = 3x^2ydy - 5xy^2dx.$

**Задача 2.** Найти общий интеграл дифференциального уравнения.

$$2.1. y' = \frac{y^2}{x^2} + 4\frac{y}{x} + 2.$$

$$2.3. y' = \frac{x+y}{x-y}.$$

$$2.5. 2y' = \frac{y^2}{x^2} + 6\frac{y}{x} + 3.$$

$$2.7. y' = \frac{x+2y}{2x-y}.$$

$$2.9. 3y' = \frac{y^2}{x^2} + 8\frac{y}{x} + 4.$$

$$2.11. y' = \frac{x^2 + xy - y^2}{x^2 - 2xy}.$$

$$2.13. y' = \frac{y^2}{x^2} + 6\frac{y}{x} + 6.$$

$$2.15. y' = \frac{x^2 + 2xy - y^2}{2x^2 - 2xy}.$$

$$2.17. 2y' = \frac{y^2}{x^2} + 8\frac{y}{x} + 8.$$

$$2.19. y' = \frac{x^2 + 3xy - y^2}{3x^2 - 2xy}.$$

$$2.21. y' = \frac{y^2}{x^2} + 8\frac{y}{x} + 12.$$

$$2.23. y' = \frac{x^2 + xy - 3y^2}{x^2 - 4xy}.$$

$$2.25. 4y' = \frac{y^2}{x^2} + 10\frac{y}{x} + 5.$$

$$2.27. y' = \frac{x^2 + xy - 5y^2}{x^2 - 6xy}.$$

$$2.2. xy' = \frac{3y^3 + 2yx^2}{2y^2 + x^2}.$$

$$2.4. xy' = \sqrt{x^2 + y^2} + y.$$

$$2.6. xy' = \frac{3y^3 + 4yx^2}{2y^2 + 2x^2}.$$

$$2.8. xy' = 2\sqrt{x^2 + y^2} + y.$$

$$2.10. xy' = \frac{3y^3 + 6yx^2}{2y^2 + 3x^2}.$$

$$2.12. xy' = \sqrt{2x^2 + y^2} + y.$$

$$2.14. xy' = \frac{3y^3 + 8yx^2}{2y^2 + 4x^2}.$$

$$2.16. xy' = 3\sqrt{x^2 + y^2} + y.$$

$$2.18. xy' = \frac{3y^3 + 10yx^2}{2y^2 + 5x^2}.$$

$$2.20. xy' = 3\sqrt{2x^2 + y^2} + y.$$

$$2.22. xy' = \frac{3y^3 + 12yx^2}{2y^2 + 6x^2}.$$

$$2.24. xy' = 2\sqrt{3x^2 + y^2} + y.$$

$$2.26. xy' = \frac{3y^3 + 14yx^2}{2y^2 + 7x^2}.$$

$$2.28. xy' = 4\sqrt{x^2 + y^2} + y.$$

$$2.29. 3y' = \frac{y^2}{x^2} + 10\frac{y}{x} + 10.$$

$$2.30. xy' = 4\sqrt{2x^2 + y^2} + y.$$

$$2.31. y' = \frac{x^2 + 2xy - 5y^2}{2x^2 - 6xy}.$$

**Задача 3.** Найти общий интеграл дифференциального уравнения.

$$3.1. y' = \frac{x + 2y - 3}{2x - 2}.$$

$$3.2. y' = \frac{x + y - 2}{2x - 2}.$$

$$3.3. y' = \frac{3y - x - 4}{3x + 3}.$$

$$3.4. y' = \frac{2y - 2}{x + y - 2}.$$

$$3.5. y' = \frac{x + y - 2}{3x - y - 2}.$$

$$3.6. y' = \frac{2x + y - 3}{x - 1}.$$

$$3.7. y' = \frac{x + y - 8}{3x - y - 8}.$$

$$3.8. y' = \frac{x + 3y + 4}{3x - 6}.$$

$$3.9. y' = \frac{3y + 3}{2x + y - 1}.$$

$$3.10. y' = \frac{x + 2y - 3}{4x - y - 3}.$$

$$3.11. y' = \frac{x - 2y + 3}{-2x - 2}.$$

$$3.12. y' = \frac{x + 8y - 9}{10x - y - 9}.$$

$$3.13. y' = \frac{2x + 3y - 5}{5x - 5}.$$

$$3.14. y' = \frac{4y - 8}{3x + 2y - 7}.$$

$$3.15. y' = \frac{x + 3y - 4}{5x - y - 4}.$$

$$3.16. y' = \frac{y - 2x + 3}{x - 1}.$$

$$3.17. y' = \frac{x + 2y - 3}{x - 1}.$$

$$3.18. y' = \frac{3x + 2y - 1}{x + 1}.$$

$$3.19. y' = \frac{5y + 5}{4x + 3y - 1}.$$

$$3.20. y' = \frac{x + 4y - 5}{6x - y - 5}.$$

$$3.21. y' = \frac{x + y + 2}{x + 1}.$$

$$3.22. y' = \frac{2x + y - 3}{4x - 4}.$$

$$3.23. y' = \frac{2x + y - 3}{2x - 2}.$$

$$3.24. y' = \frac{y}{2x + 2y - 2}.$$

3.25.  $y' = \frac{x+5y-6}{7x-y-6}$ .

3.26.  $y' = \frac{x+y-4}{x-2}$ .

3.27.  $y' = \frac{2x+y-1}{2x-2}$ .

3.28.  $y' = \frac{3y-2x+1}{3x+3}$ .

3.29.  $y' = \frac{6y-6}{5x+4y-9}$ .

3.30.  $y' = \frac{x+6y-7}{8x-y-7}$ .

3.31.  $y' = \frac{y+2}{2x+y-4}$ .

**Задача 4.** Найти решение задачи Коши.

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

4.2.  $y' - y \operatorname{ctg} x = 2x \sin x, \quad y(\pi/2) = 0.$

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

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

4.5.  $y' - \frac{y}{x+2} = x^2 + 2x, \quad y(-1) = 3/2.$

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

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

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

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

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

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

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

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

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

4.15.  $y' + \frac{2}{x} y = x^3, \quad y(1) = -5/6.$

4.16.  $y' + \frac{y}{x} = 3x, \quad y(1) = 1.$

4.17.  $y' - \frac{2xy}{1+x^2} = 1+x^2, \quad y(1) = 3.$

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

4.19.  $y' + \frac{3y}{x} = \frac{2}{x^3}, \quad y(1) = 1.$

4.20.  $y' + 2xy = -2x^3, \quad y(1) = e^{-1}.$

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

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

$$4.23. y' - \frac{2}{x+1}y = e^x(x+1)^2, \quad y(0) = 1. \quad 4.24. y' + 2xy = xe^{-x^2} \sin x, \quad y(0) = 1.$$

$$4.25. y' - 2y/(x+1) = (x+1)^3, \quad y(0) = 1/2. \quad 4.26. y' - y \cos x = -\sin 2x, \quad y(0) = 3.$$

$$4.27. y' - 4xy = -4x^3, \quad y(0) = -1/2. \quad 4.28. y' - \frac{y}{x} = -\frac{\ln x}{x}, \quad y(1) = 1.$$

$$4.29. y' - 3x^2y = x^2(1+x^3)/3, \quad y(0) = 0. \quad 4.30. y' - y \cos x = \sin 2x, \quad y(0) = -1.$$

$$4.31. y' - y/x = -2/x^2, \quad y(1) = 1.$$

**Задача 5.** Решить задачу Коши.

$$5.1. y^2 dx + (x + e^{2/y}) dy = 0, \quad y|_{x=e} = 2.$$

$$5.2. (y^4 e^y + 2x) y' = y, \quad y|_{x=0} = 1.$$

$$5.3. y^2 dx + (xy - 1) dy = 0, \quad y|_{x=1} = e.$$

$$5.4. 2(4y^2 + 4y - x) y' = 1, \quad y|_{x=0} = 0.$$

$$5.5. (\cos 2y \cos^2 y - x) y' = \sin y \cos y, \quad y|_{x=1/4} = \pi/3.$$

$$5.6. (x \cos^2 y - y^2) y' = y \cos^2 y, \quad y|_{x=\pi} = \pi/4.$$

$$5.7. e^{y^2} (dx - 2xy dy) = y dy, \quad y|_{x=0} = 0.$$

$$5.8. (104y^3 - x) y' = 4y, \quad y|_{x=8} = 1.$$

$$5.9. dx + (xy - y^3) dy = 0, \quad y|_{x=-1} = 0.$$

$$5.10. (3y \cos 2y - 2y^2 \sin 2y - 2x) y' = y, \quad y|_{x=16} = \pi/4.$$

$$5.11. 8(4y^3 + xy - y) y' = 1, \quad y|_{x=0} = 0.$$

$$5.12. (2 \ln y - \ln^2 y) dy = y dx - x dy, \quad y|_{x=4} = e^2.$$

$$5.13. 2(x + y^4) y' = y, \quad y|_{x=-2} = -1.$$

$$5.14. y^3 (y-1) dx + 3xy^2 (y-1) dy = (y+2) dy, \quad y|_{x=1/4} = 2.$$

$$5.15. 2y^2 dx + (x + e^{1/y}) dy = 0, \quad y|_{x=e} = 1.$$

$$5.16. (xy + \sqrt{y})dy + y^2 dx = 0, \quad y|_{x=-1/2} = 4.$$

$$5.17. \sin 2y dx = (\sin^2 2y - 2\sin^2 y + 2x)dy, \quad y|_{x=-1/2} = \pi/4.$$

$$5.18. (y^2 + 2y - x)y' = 1, \quad y|_{x=2} = 0.$$

$$5.19. 2y\sqrt{y}dx - (6x\sqrt{y} + 7)dy = 0, \quad y|_{x=-4} = 1.$$

$$5.20. dx = (\sin y + 3\cos y + 3x)dy, \quad y|_{x=e^{\pi/2}} = \pi/2.$$

$$5.21. 2(\cos^2 y \cdot \cos 2y - x)y' = \sin 2y, \quad y|_{x=3/2} = 5\pi/4.$$

$$5.22. \operatorname{ch} y dx = (1 + x \operatorname{sh} x)dy, \quad y|_{x=1} = \ln 2.$$

$$5.23. (13y^3 - x)y' = 4y, \quad y|_{x=5} = 1.$$

$$5.24. y^2(y^2 + 4)dx + 2xy(y^2 + 4)dy = 2dy, \quad y|_{x=\pi/8} = 2.$$

$$5.25. (x + \ln^2 y - \ln y)y' = y/2, \quad y|_{x=2} = 1.$$

$$5.26. (2xy + \sqrt{y})dy + 2y^2 dx = 0, \quad y|_{x=-1/2} = 1.$$

$$5.27. ydx + (2x - 2\sin^2 y - y \sin 2y)dy = 0, \quad y|_{x=3/2} = \pi/4.$$

$$5.28. 2(y^3 - y + xy)dy = dx, \quad y|_{x=-2} = 0.$$

$$5.29. (2y + x \operatorname{tg} y - y^2 \operatorname{tg} y)dy = dx, \quad y|_{x=0} = \pi.$$

$$5.30. 4y^2 dx + (e^{1/(2y)} + x)dy = 0, \quad y|_{x=e} = 1/2.$$

$$5.31. dx + (2x + \sin 2y - 2\cos^2 y)dy = 0, \quad y|_{x=-1} = 0.$$

**Задача 6.** Найти решение задачи Коши.

$$6.1. y' + xy = (1+x)e^{-x} y^2, \quad y(0) = 1.$$

$$6.2. xy' + y = 2y^2 \ln x, \quad y(1) = 1/2.$$

$$6.3. 2(xy' + y) = xy^2, \quad y(1) = 2.$$

$$6.4. y' + 4x^3 y = 4(x^3 + 1)e^{-4x} y^2, \quad y(0) = 1.$$

- 6.5.  $xy' - y = -y^2(\ln x + 2)\ln x, \quad y(1) = 1.$
- 6.6.  $2(y' + xy) = (1 + x)e^{-x}y^2, \quad y(0) = 2.$
- 6.7.  $3(xy' + y) = y^2 \ln x, \quad y(1) = 3.$
- 6.8.  $2y' + y \cos x = y^{-1} \cos x(1 + \sin x), \quad y(0) = 1.$
- 6.9.  $y' + 4x^3y = 4y^2 e^{4x}(1 - x^3), \quad y(0) = -1.$
- 6.10.  $3y' + 2xy = 2xy^{-2} e^{-2x^2}, \quad y(0) = -1.$
- 6.11.  $2xy' - 3y = -(5x^2 + 3)y^3, \quad y(1) = 1/\sqrt{2}.$
- 6.12.  $3xy' + 5y = (4x - 5)y^4, \quad y(1) = 1.$
- 6.13.  $2y' + 3y \cos x = e^{2x}(2 + 3 \cos x)y^{-1}, \quad y(0) = 1.$
- 6.14.  $3(xy' + y) = xy^2, \quad y(1) = 3.$
- 6.15.  $y' - y = 2xy^2, \quad y(0) = 1/2.$
- 6.16.  $2xy' - 3y = -(20x^2 + 12)y^3, \quad y(1) = 1/2\sqrt{2}.$
- 6.17.  $y' + 2xy = 2x^3y^3, \quad y(0) = \sqrt{2}.$
- 6.18.  $xy' + y = y^2 \ln x, \quad y(1) = 1.$
- 6.19.  $2y' + 3y \cos x = (8 + 12 \cos x)e^{2x}y^{-1}, \quad y(0) = 2.$
- 6.20.  $4y' + x^3y = (x^3 + 8)e^{-2x}y^2, \quad y(0) = 1.$
- 6.21.  $8xy' - 12y = -(5x^2 + 3)y^3, \quad y(1) = \sqrt{2}.$
- 6.22.  $2(y' + y) = xy^2, \quad y(0) = 2.$
- 6.23.  $y' + xy = (x - 1)e^x y^2, \quad y(0) = 1.$
- 6.24.  $2y' + 3y \cos x = -e^{-2x}(2 + 3 \cos x)y^{-1}, \quad y(0) = 1.$
- 6.25.  $y' - y = xy^2, \quad y(0) = 1.$
- 6.26.  $2(xy' + y) = y^2 \ln x, \quad y(1) = 2.$
- 6.27.  $y' + y = xy^2, \quad y(0) = 1.$

$$6.28. y' + 2y \operatorname{cth} x = y^2 \operatorname{ch} x, \quad y(1) = 1/\operatorname{sh} 1.$$

$$6.29. 2(y' + xy) = (x-1)e^x y^2, \quad y(0) = 2.$$

$$6.30. y' - y \operatorname{tg} x = -(2/3)y^4 \sin x, \quad y(0) = 1.$$

$$6.31. xy' + y = xy^2, \quad y(1) = 1.$$

**Задача 7.** Найти общий интеграл дифференциального уравнения.

$$7.1. 3x^2 e^y dx + (x^3 e^y - 1) dy = 0.$$

$$7.2. \left( 3x^2 + \frac{2}{y} \cos \frac{2x}{y} \right) dx - \frac{2x}{y^2} \cos \frac{2x}{y} dy = 0.$$

$$7.3. (3x^2 + 4y^2) dx + (8xy + e^y) dy = 0.$$

$$7.4. \left( 2x - 1 - \frac{y}{x^2} \right) dx - \left( 2y - \frac{1}{x} \right) dy = 0.$$

$$7.5. (y^2 + y \sec^2 x) dx + (2xy + \operatorname{tg} x) dy = 0.$$

$$7.6. (3x^2 y + 2y + 3) dx + (x^3 + 2x + 3y^2) dy = 0.$$

$$7.7. \left( \frac{x}{\sqrt{x^2 + y^2}} + \frac{1}{x} + \frac{1}{y} \right) dx + \left( \frac{y}{\sqrt{x^2 + y^2}} + \frac{1}{x} - \frac{x}{y^2} \right) dy = 0.$$

$$7.8. [\sin 2x - 2 \cos(x+y)] dx - 2 \cos(x+y) dy = 0.$$

$$7.9. (xy^2 + x/y^2) dx + (x^2 y - x^2/y^3) dy = 0.$$

$$7.10. \left( \frac{1}{x^2} + \frac{3y^2}{x^4} \right) dx - \frac{2y}{x^3} dy = 0.$$

$$7.11. \frac{y}{x^2} \cos \frac{y}{x} dx - \left( \frac{1}{x} \cos \frac{y}{x} + 2y \right) dy = 0.$$

$$7.12. \left( \frac{x}{\sqrt{x^2 + y^2}} + y \right) dx + \left( x + \frac{y}{\sqrt{x^2 + y^2}} \right) dy = 0.$$



7.13.  $\frac{1+xy}{x^2y}dx + \frac{1-xy}{xy^2}dy = 0.$

7.14.  $\frac{dx}{y} - \frac{x+y^2}{y^2}dy = 0.$

7.15.  $\frac{y}{x^2}dx - \frac{xy+1}{x}dy = 0.$

7.16.  $\left(xe^x + \frac{y}{x^2}\right)dx - \frac{1}{x}dy = 0.$

7.17.  $\left(10xy - \frac{1}{\sin y}\right)dx + \left(5x^2 + \frac{x \cos y}{\sin^2 y} - y^2 \sin y^3\right)dy = 0.$

7.18.  $\left(\frac{y}{x^2+y^2} + e^x\right)dx - \frac{xdy}{x^2+y^2} = 0.$

7.19.  $e^y dx + (\cos y + xe^y)dy = 0.$

7.20.  $(y^3 + \cos x)dx + (3xy^2 + e^y)dy = 0.$

7.21.  $xe^{y^2}dx + (x^2ye^{y^2} + \operatorname{tg}^2 y)dy = 0.$

7.22.  $(5xy^2 - x^3)dx + (5x^2y - y)dy = 0.$

7.23.  $[\cos(x+y^2) + \sin x]dx + 2y \cos(x+y^2)dy = 0.$

7.24.  $(x^2 - 4xy - 2y^2)dx + (y^2 - 4xy - 2x^2)dy = 0.$

7.25.  $\left(\sin y + y \sin y + \frac{1}{x}\right)dx + \left(x \cos y - \cos x + \frac{1}{y}\right)dy = 0.$

7.26.  $\left(1 + \frac{1}{y}e^{x/y}\right)dx + \left(1 - \frac{x}{y^2}e^{x/y}\right)dy = 0.$

7.27.  $\frac{(x-y)dx + (x+y)dy}{x^2+y^2} = 0.$

7.28.  $2(3xy^2 + 2x^3)dx + 3(2x^2y + y^2)dy = 0.$

7.29.  $(3x^3 + 6x^2y + 3xy^2)dx + (2x^3 + 3x^2y)dy = 0.$

7.30.  $xy^2dx + y(x^2 + y^2)dy = 0.$

7.31.  $xdx + ydy + (xdy - ydx)/(x^2 + y^2) = 0.$

**Задача 8.** Для данного дифференциального уравнения методом изоклин построить интегральную кривую, проходящую через точку  $M$ .

8.1.  $y' = y - x^2$ ,  $M(1, 2)$ .

8.2.  $yy' = -2x$ ,  $M(0, 5)$ .

8.3.  $y' = 2 + y^2$ ,  $M(1, 2)$ .

8.4.  $y' = \frac{2x}{3y}$ ,  $M(1, 1)$ .

8.5.  $y' = (y - 1)x$ ,  $M(1, 3/2)$ .

8.6.  $yy' + x = 0$ ,  $M(-2, -3)$ .

8.7.  $y' = 3 + y^2$ ,  $M(1, 2)$ .

8.8.  $xy' = 2y$ ,  $M(2, 3)$ .

8.9.  $y'(x^2 + 2) = y$ ,  $M(2, 2)$ .

8.10.  $x^2 - y^2 + 2xyy' = 0$ ,  $M(2, 1)$ .

8.11.  $y' = y - x$ ,  $M(9/2, 1)$ .

8.12.  $y' = x^2 - y$ ,  $M(1, 1/2)$ .

8.13.  $y' = xy$ ,  $M(0, -1)$ .

8.14.  $y' = xy$ ,  $M(0, 1)$ .

8.15.  $yy' = -\frac{x}{2}$ ,  $M(4, 2)$ .

8.16.  $2(y + y') = x + 3$ ,  $M(1, 1/2)$ .

8.17.  $y' = x + 2y$ ,  $M(3, 0)$ .

8.18.  $xy' = 2y$ ,  $M(1, 3)$ .

8.19.  $3yy' = x$ ,  $M(-3, -2)$ .

8.20.  $y' = y - x^2$ ,  $M(-3, 4)$ .

8.21.  $x^2 - y^2 + 2xyy' = 0$ ,  $M(-2, 1)$ .

8.22.  $y' = x^2 - y$ ,  $M(2, 3/2)$ .

8.23.  $y' = y - x$ ,  $M(2, 1)$ .

8.24.  $yy' = -x$ ,  $M(2, 3)$ .

8.25.  $y' = y - x$ ,  $M(4, 2)$ .

8.26.  $3yy' = x$ ,  $M(1, 1)$ .

8.27.  $y' = x^2 - y$ ,  $M(0, 1)$ .

8.28.  $y' = 3y^{2/3}$ ,  $M(1, 3)$ .

8.29.  $x^2 - y^2 + 2xyy' = 0$ ,  $M(-2, -1)$ .

8.30.  $y' = x(y - 1)$ ,  $M(1, 1/2)$ .

8.31.  $y' = x + 2y$ ,  $M(1, 2)$ .

**Задача 9.** Найти линию, проходящую через точку  $M_0$  и обладающую тем свойством, что в любой ее точке  $M$  нормальный вектор  $\overline{MN}$  с концом на оси  $Oy$  имеет длину, равную  $a$ , и образует острый угол с положительным направлением оси  $Oy$ .

9.1.  $M_0(15, 1)$ ,  $a = 25$ .

9.2.  $M_0(12, 2)$ ,  $a = 20$ .

9.3.  $M_0(9, 3)$ ,  $a = 15$ .

9.4.  $M_0(6, 4)$ ,  $a = 10$ .

9.5.  $M_0(3, 5)$ ,  $a = 5$ .

Найти линию, проходящую через точку  $M_0$ , если отрезок любой ее касательной между точкой касания и осью  $Oy$  делится в точке пересечения с осью абсцисс в отношении  $a : b$  (считая от оси  $Oy$ ).

9.6.  $M_0(1, 1)$ ,  $a : b = 1 : 2$ .

9.7.  $M_0(-2, 3)$ ,  $a : b = 1 : 3$ .

9.8.  $M_0(0, 1)$ ,  $a : b = 2 : 3$ .

9.9.  $M_0(1, 0)$ ,  $a : b = 3 : 2$ .

9.10.  $M_0(2, -1)$ ,  $a : b = 3 : 1$ .

Найти линию, проходящую через точку  $M_0$ , если отрезок любой ее касательной между точкой касания и осью  $Oy$  делится в точке пересечения с осью абсцисс в отношении  $a : b$  (считая от оси  $Oy$ ).

9.11.  $M_0(2, -1)$ ,  $a : b = 1 : 1$ .

9.12.  $M_0(1, 2)$ ,  $a : b = 2 : 1$ .

9.13.  $M_0(-1, 1)$ ,  $a : b = 3 : 1$ .

9.14.  $M_0(2, 1)$ ,  $a : b = 1 : 2$ .

9.15.  $M_0(1, -1)$ ,  $a : b = 1 : 3$ .

Найти линию, проходящую через точку  $M_0$ , если отрезок любой ее касательной, заключенный между осями координат, делится в точке касания в отношении  $a : b$  (считая от оси  $Oy$ ).

9.16.  $M_0(1, 2)$ ,  $a : b = 1 : 1$ .

9.17.  $M_0(2, 1)$ ,  $a : b = 1 : 2$ .

9.18.  $M_0(1, 3)$ ,  $a : b = 2 : 1$ .

9.19.  $M_0(2, -3)$ ,  $a : b = 3 : 1$ .

9.20.  $M_0(3, -1)$ ,  $a : b = 3 : 2$ .

Найти линию, проходящую через точку  $M_0$  и обладающую тем свойством, что в любой ее точке  $M$  касательный вектор  $\overrightarrow{MN}$  с концом на оси  $Ox$  имеет проекцию на ось  $Ox$ , обратно пропорциональную абсциссе точки  $M$ . Коэффициент пропорциональности равен  $a$ .

9.21.  $M_0(1, e)$ ,  $a = -1/2$ .

9.22.  $M_0(2, e)$ ,  $a = -2$ .

9.23.  $M_0(-1, \sqrt{e})$ ,  $a = -1$ .

9.24.  $M_0(2, 1/e)$ ,  $a = 2$ .

9.25.  $M_0(1, 1/e^2)$ ,  $a = 1/4$ .

Найти линию, проходящую через точку  $M_0$  и обладающую тем свойством, что в любой ее точке  $M$  касательный вектор  $\overline{MN}$  с концом на оси  $Oy$  имеет проекцию на ось  $Ox$ , равную  $a$ .

$$9.26. M_0(1, 2), \quad a = -1.$$

$$9.27. M_0(1, 4), \quad a = 2.$$

$$9.28. M_0(1, 5), \quad a = -2.$$

$$9.29. M_0(1, 3), \quad a = -4.$$

$$9.30. M_0(1, 6), \quad a = 3.$$

$$9.31. M_0(1, 1), \quad a = 1.$$

**Задача 10.** Найти общее решение дифференциального уравнения.

$$10.1. y'''x \ln x = y''.$$

$$10.2. xy''' + y'' = 1.$$

$$10.3. 2xy''' = y''.$$

$$10.4. xy''' + y'' = x + 1.$$

$$10.5. \operatorname{tg} x \cdot y'' - y' + \frac{1}{\sin x} = 0.$$

$$10.6. x^2 y'' + xy' = 1.$$

$$10.7. y''' \operatorname{ctg} 2x + 2y'' = 0.$$

$$10.8. x^3 y''' + x^2 y'' = 1.$$

$$10.9. \operatorname{tg} x \cdot y''' = 2y''.$$

$$10.10. y''' \operatorname{cth} 2x = 2y''.$$

$$10.11. x^4 y'' + x^3 y' = 1.$$

$$10.12. xy''' + 2y'' = 0.$$

$$10.13. (1 + x^2) y'' + 2xy' = x^3.$$

$$10.14. x^5 y''' + x^4 y'' = 1.$$

$$10.15. xy''' - y'' + \frac{1}{x} = 0.$$

$$10.16. xy''' + y'' + x = 0.$$

$$10.17. \operatorname{th} x \cdot y^{IV} = y''.$$

$$10.18. xy''' + y'' = \sqrt{x}.$$

$$10.19. y''' \operatorname{tg} x = y'' + 1.$$

$$10.20. y''' \operatorname{tg} 5x = 5y''.$$

$$10.21. y''' \operatorname{th} 7x = 7y''.$$

$$10.22. x^3 y''' + x^2 y'' = \sqrt{x}.$$

$$10.23. \operatorname{cth} x \cdot y'' - y' + \frac{1}{\operatorname{ch} x} = 0.$$

$$10.24. (x + 1) y''' + y'' = (x + 1).$$

$$10.25. (1 + \sin x) y''' = \cos x \cdot y''.$$

$$10.26. xy''' + y'' = \frac{1}{\sqrt{x}}.$$

$$10.27. -xy''' + 2y'' = \frac{2}{x^2}.$$

$$10.28. \operatorname{cth} xy'' + y' = \operatorname{ch} x.$$

10.29.  $x^4 y'' + x^3 y' = 4$ .

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

10.31.  $(1 + x^2) y'' + 2xy' = 12x^3$ .

**Задача 11.** Найти решение задачи Коши.

11.1.  $4y^3 y'' = y^4 - 1, \quad y(0) = \sqrt{2}, \quad y'(0) = 1/(2\sqrt{2})$ .

11.2.  $y'' = 128y^3, \quad y(0) = 1, \quad y'(0) = 8$ .

11.3.  $y'' y^3 + 64 = 0, \quad y(0) = 4, \quad y'(0) = 2$ .

11.4.  $y'' + 2 \sin y \cos^3 y = 0, \quad y(0) = 0, \quad y'(0) = 1$ .

11.5.  $y'' = 32 \sin^3 y \cos y, \quad y(1) = \pi/2, \quad y'(1) = 4$ .

11.6.  $y'' = 98y^3, \quad y(1) = 1, \quad y'(1) = 7$ .

11.7.  $y'' y^3 + 49 = 0, \quad y(3) = -7, \quad y'(3) = -1$ .

11.8.  $4y^3 y'' = 16y^4 - 1, \quad y(0) = \sqrt{2}/2, \quad y'(0) = 1/\sqrt{2}$ .

11.9.  $y'' + 8 \sin y \cos^3 y = 0, \quad y(0) = 0, \quad y'(0) = 2$ .

11.10.  $y'' = 72y^3, \quad y(2) = 1, \quad y'(2) = 6$ .

11.11.  $y'' y^3 + 36 = 0, \quad y(0) = 3, \quad y'(0) = 2$ .

11.12.  $y'' = 18 \sin^3 y \cos y, \quad y(1) = \pi/2, \quad y'(1) = 3$ .

11.13.  $4y^3 y'' = y^4 - 16, \quad y(0) = 2\sqrt{2}, \quad y'(0) = 1/\sqrt{2}$ .

11.14.  $y'' = 50y^3, \quad y(3) = 1, \quad y'(3) = 5$ .

11.15.  $y'' y^3 + 25 = 0, \quad y(2) = -5, \quad y'(2) = -1$ .

11.16.  $y'' + 18 \sin y \cos^3 y = 0, \quad y(0) = 0, \quad y'(0) = 3$ .

11.17.  $y'' = 8 \sin^3 y \cos y, \quad y(1) = \pi/2, \quad y'(1) = 2$ .

11.18.  $y'' = 32y^3, \quad y(4) = 1, \quad y'(4) = 4$ .

11.19.  $y'' y^3 + 16 = 0, \quad y(1) = 2, \quad y'(1) = 2$ .

$$11.20. y'' + 32 \sin y \cos^3 y = 0, \quad y(0) = 0, \quad y'(0) = 4.$$

$$11.21. y'' = 50 \sin^3 y \cos y, \quad y(1) = \pi/2, \quad y'(1) = 5.$$

$$11.22. y'' = 18y^3, \quad y(1) = 1, \quad y'(1) = 3.$$

$$11.23. y''y^3 + 9 = 0, \quad y(1) = 1, \quad y'(1) = 3.$$

$$11.24. y^3 y'' = 4(y^4 - 1), \quad y(0) = \sqrt{2}, \quad y'(0) = \sqrt{2}.$$

$$11.25. y'' + 50 \sin y \cos^3 y = 0, \quad y(0) = 0, \quad y'(0) = 5.$$

$$11.26. y'' = 8y^3, \quad y(0) = 1, \quad y'(0) = 2.$$

$$11.27. y''y^3 + 4 = 0, \quad y(0) = -1, \quad y'(0) = -2.$$

$$11.28. y'' = 2 \sin^3 y \cos y, \quad y(1) = \pi/2, \quad y'(1) = 1.$$

$$11.29. y^3 y'' = y^4 - 16, \quad y(0) = 2\sqrt{2}, \quad y'(0) = \sqrt{2}.$$

$$11.30. y'' = 2y^3, \quad y(-1) = 1, \quad y'(-1) = 1.$$

$$11.31. y''y^3 + 1 = 0, \quad y(1) = -1, \quad y'(1) = -1.$$

**Задача 12.** Найти общее решение дифференциального уравнения.

$$12.1. y''' + 3y'' + 2y' = 1 - x^2.$$

$$12.2. y''' - y'' = 6x^2 + 3x.$$

$$12.3. y''' - y' = x^2 + x.$$

$$12.4. y^{IV} - 3y''' + 3y'' - y' = 2x.$$

$$12.5. y^{IV} - y''' = 5(x + 2)^2.$$

$$12.6. y^{IV} - 2y''' + y'' = 2x(1 - x).$$

$$12.7. y^{IV} + 2y''' + y'' = x^2 + x - 1.$$

$$12.8. y^V - y^{IV} = 2x + 3.$$

$$12.9. 3y^{IV} + y''' = 6x - 1.$$

$$12.10. y^{IV} + 2y''' + y'' = 4x^2.$$

$$12.11. y''' + y'' = 5x^2 - 1.$$

$$12.12. y^{IV} + 4y''' + 4y'' = x - x^2.$$

$$12.13. 7y''' - y'' = 12x.$$

$$12.14. y''' + 3y'' + 2y' = 3x^2 + 2x.$$

$$12.15. y''' - y' = 3x^2 - 2x + 1.$$

$$12.16. y''' - y'' = 4x^2 - 3x + 2.$$

$$12.17. y^{IV} - 3y''' + 3y'' - y' = x - 3.$$

$$12.18. y^{IV} + 2y''' + y'' = 12x^2 - 6x.$$

$$12.19. y''' - 4y'' = 32 - 384x^2.$$

$$12.20. y^{IV} + 2y''' + y'' = 2 - 3x^2.$$

12.21.  $y''' + y'' = 49 - 24x^2$ .

12.22.  $y''' - 2y'' = 3x^2 + x - 4$ .

12.23.  $y''' - 13y'' + 12y' = x - 1$ .

12.24.  $y^{IV} + y''' = x$ .

12.25.  $y''' - y'' = 6x + 5$ .

12.26.  $y''' + 3y'' + 2y' = x^2 + 2x + 3$ .

12.27.  $y''' - 5y'' + 6y' = (x - 1)^2$ .

12.28.  $y^{IV} - 6y''' + 9y'' = 3x - 1$ .

12.29.  $y''' - 13y'' + 12y' = 18x^2 - 39$ .

12.30.  $y^{IV} + y''' = 12x + 6$ .

12.31.  $y''' - 5y'' + 6y' = 6x^2 + 2x - 5$ .

**Задача 13.** Найти общее решение дифференциального уравнения.

13.1.  $y''' - 4y'' + 5y' - 2y = (16 - 12x)e^{-x}$ .

13.2.  $y''' - 3y'' + 2y' = (1 - 2x)e^x$ .

13.3.  $y''' - y'' - y' + y = (3x + 7)e^{2x}$ .

13.4.  $y''' - 2y'' + y' = (2x + 5)e^{2x}$ .

13.5.  $y''' - 3y'' + 4y = (18x - 21)e^{-x}$ .

13.6.  $y''' - 5y'' + 8y' - 4y = (2x - 5)e^x$ .

13.7.  $y''' - 4y'' + 4y' = (x - 1)e^x$ .

13.8.  $y''' + 2y'' + y' = (18x + 21)e^{2x}$ .

13.9.  $y''' + y'' - y' - y = (8x + 4)e^x$ .

13.10.  $y''' - 3y' - 2y = -4x \cdot e^x$ .

13.11.  $y''' - 3y' + 2y = (4x + 9)e^{2x}$ .

13.12.  $y''' + 4y'' + 5y' + 2y = (12x + 16)e^x$ .

13.13.  $y''' - y'' - 2y' = (6x - 11)e^{-x}$ .

13.14.  $y''' + y'' - 2y' = (6x + 5)e^x$ .

13.15.  $y''' + 4y'' + 4y' = (9x + 15)e^x$ .

13.16.  $y''' - 3y'' - y' + 3y = (4 - 8x)e^x$ .

- 13.17.  $y''' - y'' - 4y' + 4y = (7 - 6x)e^x$ .
- 13.18.  $y''' + 3y'' + 2y' = (1 - 2x)e^{-x}$ .
- 13.19.  $y''' - 5y'' + 7y' - 3y = (20 - 16x)e^{-x}$ .
- 13.20.  $y''' - 4y'' + 3y' = -4x \cdot e^x$ .
- 13.21.  $y''' - 5y'' + 3y' + 9y = (32x - 32)e^{-x}$ .
- 13.22.  $y''' - 6y'' + 9y' = 4x \cdot e^x$ .
- 13.23.  $y''' - 7y'' + 15y' - 9y = (8x - 12)e^x$ .
- 13.24.  $y''' - y'' - 5y' - 3y = -(8x + 4)e^x$ .
- 13.25.  $y''' + 5y'' + 7y' + 3y = (16x + 20)e^x$ .
- 13.26.  $y''' - 2y'' - 3y' = (8x - 14)e^{-x}$ .
- 13.27.  $y''' + 2y'' - 3y' = (8x + 6)e^x$ .
- 13.28.  $y''' + 6y'' + 9y' = (16x + 24)e^x$ .
- 13.29.  $y''' - y'' - 9y' + 9y = (12 - 16x)e^x$ .
- 13.30.  $y''' + 4y'' + 3y' = 4(1 - x)e^{-x}$ .
- 13.31.  $y''' + y'' - 6y' = (20x + 14)e^{2x}$ .

**Задача 14.** Найти общее решение дифференциального уравнения.

- 14.1.  $y'' + 2y' = 4e^x(\sin x + \cos x)$ .
- 14.2.  $y'' - 4y' + 4y = -e^{2x} \sin 6x$ .
- 14.3.  $y'' + 2y' = -2e^x(\sin x + \cos x)$ .
- 14.4.  $y'' + y = 2 \cos 7x + 3 \sin 7x$ .
- 14.5.  $y'' + 2y' + 5y = -\sin 2x$ .
- 14.6.  $y'' - 4y' + 8y = e^x(5 \sin x - 3 \cos x)$ .
- 14.7.  $y'' + 2y' = e^x(\sin x + \cos x)$ .
- 14.8.  $y'' - 4y' + 4y = e^{2x} \sin 3x$ .
- 14.9.  $y'' + 6y' + 13y = e^{-3x} \cos 4x$ .
- 14.10.  $y'' + y = 2 \cos 3x - 3 \sin 3x$ .
- 14.11.  $y'' + 2y' + 5y = -2 \sin x$ .
- 14.12.  $y'' - 4y' + 8y = e^x(-3 \sin x + 4 \cos x)$ .
- 14.13.  $y'' + 2y' = 10e^x(\sin x + \cos x)$ .
- 14.14.  $y'' - 4y' + 4y = e^{2x} \sin 5x$ .



- 14.15.  $y'' + y = 2 \cos 5x + 3 \sin 5x$ .      14.16.  $y'' + 2y' + 5y = -17 \sin 2x$ .
- 14.17.  $y'' + 6y' + 13y = e^{-3x} \cos x$ .      14.18.  $y'' - 4y' + 8y = e^x (3 \sin x + 5 \cos x)$ .
- 14.19.  $y'' + 2y' = 6e^x (\sin x + \cos x)$ .      14.20.  $y'' - 4y' + 4y = -e^{2x} \sin 4x$ .
- 14.21.  $y'' + 6y' + 13y = -e^{3x} \cos 5x$ .      14.22.  $y'' + y = 2 \cos 7x - 3 \sin 7x$ .
- 14.23.  $y'' + 2y' + 5y = -\cos x$ .      14.24.  $y'' - 4y' + 8y = e^x (2 \sin x - \cos x)$ .
- 14.25.  $y'' + 2y' = 3e^x (\sin x + \cos x)$ .      14.26.  $y'' - 4y' + 4y = e^{2x} \sin 4x$ .
- 14.27.  $y'' + 6y' + 13y = e^{-3x} \cos 8x$ .      14.28.  $y'' + 2y' + 5y = 10 \cos x$ .
- 14.29.  $y'' + y = 2 \cos 4x + 3 \sin 4x$ .      14.30.  $y'' - 4y' + 8y = e^x (-\sin x + 2 \cos x)$ .
- 14.31.  $y'' - 4y' + 4y = e^{2x} \sin 6x$ .

**Задача 15.** Найти общее решение дифференциального уравнения.

- 15.1.  $y'' - 2y' = 2 \operatorname{ch} 2x$ .
- 15.2.  $y'' + y = 2 \sin x - 6 \cos x + 2e^x$ .
- 15.3.  $y''' - y' = 2e^x + \cos x$ .
- 15.4.  $y'' - 3y' = 2 \operatorname{ch} 3x$ .
- 15.5.  $y'' + 4y = -8 \sin 2x + 32 \cos 2x + 4e^{2x}$ .
- 15.6.  $y''' - y' = 10 \sin x + 6 \cos x + 4e^x$ .
- 15.7.  $y'' - 4y' = 16 \operatorname{ch} 4x$ .
- 15.8.  $y'' + 9y = -18 \sin 3x - 18e^{3x}$ .
- 15.9.  $y''' - 4y' = 24e^{2x} - 4 \cos 2x + 8 \sin 2x$ .
- 15.10.  $y'' - 5y' = 50 \operatorname{ch} 5x$ .
- 15.11.  $y'' + 16y = 16 \cos 4x - 16e^{4x}$ .
- 15.12.  $y''' - 9y' = -9e^{3x} + 18 \sin 3x - 9 \cos 3x$ .
- 15.13.  $y'' - y' = 2 \operatorname{ch} x$ .
- 15.14.  $y'' + 25y = 20 \cos 5x - 10 \sin 5x + 50e^{5x}$ .
- 15.15.  $y''' - 16y' = 48e^{4x} + 64 \cos 4x - 64 \sin 4x$ .

$$15.16. y'' + 2y' = 2 \operatorname{sh} 2x.$$

$$15.17. y'' + 36y = 24 \sin 6x - 12 \cos 6x + 36e^{6x}.$$

$$15.18. y''' - 25y' = 25(\sin 5x + \cos 5x) - 50e^{5x}.$$

$$15.19. y'' + 3y' = 2 \operatorname{sh} 3x.$$

$$15.20. y'' + 49y = 14 \sin 7x + 7 \cos 7x - 98e^{7x}.$$

$$15.21. y''' - 36y' = 36e^{6x} - 72(\cos 6x + \sin 6x).$$

$$15.22. y'' + 4y' = 16 \operatorname{sh} 4x.$$

$$15.23. y'' + 64y = 16 \sin 8x - 16 \cos 8x - 64e^{8x}.$$

$$15.24. y''' - 49y' = 14e^{7x} - 49(\cos 7x + \sin 7x).$$

$$15.25. y'' + 5y' = 50 \operatorname{sh} 5x.$$

$$15.26. y'' + 81y = 9 \sin 9x + 3 \cos 9x + 162e^{9x}.$$

$$15.27. y''' - 64y' = 128 \cos 8x - 64e^{8x}.$$

$$15.28. y'' + y' = 2 \operatorname{sh} x.$$

$$15.29. y'' + 100y = 20 \sin 10x - 30 \cos 10x - 200e^{10x}.$$

$$15.30. y''' - 81y' = 162e^{9x} + 81 \sin 9x.$$

$$15.31. y''' - 100y' = 20e^{10x} + 100 \cos 10x.$$

**Задача 16.** Найти решение задачи Коши.

$$16.1. y'' + \pi^2 y = \pi^2 / \cos \pi x, \quad y(0) = 3, \quad y'(0) = 0.$$

$$16.2. y'' + 3y' = 9e^{3x} / (1 + e^{3x}), \quad y(0) = \ln 4, \quad y'(0) = 3(1 - \ln 2).$$

$$16.3. y'' + 4y = 8 \operatorname{ctg} 2x, \quad y(\pi/4) = 5, \quad y'(\pi/4) = 4.$$

$$16.4. y'' - 6y' + 8y = 4 / (1 + e^{-2x}), \quad y(0) = 1 + 2 \ln 2, \quad y'(0) = 6 \ln 2.$$

$$16.5. y'' - 9y' + 18y = 9e^{3x} / (1 + e^{-3x}), \quad y(0) = 0, \quad y'(0) = 0.$$

$$16.6. y'' + \pi^2 y = \pi^2 / \sin \pi x = 1, \quad y(1/2), \quad y'(1/2) = \pi^2 / 2.$$

$$16.7. y'' + \frac{1}{\pi^2} y = \frac{1}{\pi^2 \cos(x/\pi)}, \quad y(0) = 2, \quad y'(0) = 0.$$

$$16.8. y'' - 3y' = \frac{9e^{-3x}}{3 + e^{-3x}}, \quad y(0) = 4 \ln 4, \quad y'(0) = 3(3 \ln 4 - 1).$$

$$16.9. y'' + y = 4 \operatorname{ctg} x, \quad y(\pi/2) = 4, \quad y'(\pi/2) = 4.$$

$$16.10. y'' - 6y' + 8y = 4/(2 + e^{-2x}), \quad y(0) = 1 + 3 \ln 3, \quad y'(0) = 10 \ln 3.$$

$$16.11. y'' + 6y' + 8y = 4e^{-2x}/(2 + e^{2x}), \quad y(0) = 0, \quad y'(0) = 0.$$

$$16.12. y'' + 9y = 9/\sin 3x, \quad y(\pi/6) = 4, \quad y'(\pi/6) = 3\pi/2.$$

$$16.13. y'' + 9y = 9/\cos 3x, \quad y(0) = 1, \quad y'(0) = 0.$$

$$16.14. y'' - y' = e^{-x}/(2 + e^{-x}), \quad y(0) = \ln 27, \quad y'(0) = \ln 9 - 1.$$

$$16.15. y'' + 4y = 4 \operatorname{ctg} 2x, \quad y(\pi/4) = 3, \quad y'(\pi/4) = 2.$$

$$16.16. y'' - 3y' + 2y = \frac{1}{3 + e^{-x}}, \quad y(0) = 1 + 8 \ln 2, \quad y'(0) = 14 \ln 2.$$

$$16.17. y'' - 6y' + 8y = 4e^{2x}/(1 + e^{-2x}), \quad y(0) = 0, \quad y'(0) = 0.$$

$$16.18. y'' + 16y = 16/\sin 4x, \quad y(\pi/8) = 3, \quad y'(\pi/8) = 2\pi.$$

$$16.19. y'' + 16y = 16/\cos 4x, \quad y(0) = 3, \quad y'(0) = 0.$$

$$16.20. y'' - 2y' = 4e^{-2x}/(1 + e^{-2x}), \quad y(0) = \ln 4, \quad y'(0) = \ln 4 - 2.$$

$$16.21. y'' + \frac{y}{4} = \frac{1}{4} \operatorname{ctg}(x/2), \quad y(\pi) = 2, \quad y'(\pi) = 1/2.$$

$$16.22. y'' - 3y' + 2y = 1/(2 + e^{-x}), \quad y(0) = 1 + 3 \ln 3, \quad y'(0) = 5 \ln 3.$$

$$16.23. y'' + 3y' + 2y = e^{-x}/(2 + e^x), \quad y(0) = 0, \quad y'(0) = 0.$$

$$16.24. y'' + 4y = 4/\sin 2x, \quad y(\pi/4) = 2, \quad y'(\pi/4) = \pi.$$

$$16.25. y'' + 4y = 4/\cos 2x, \quad y(0) = 2, \quad y'(0) = 0.$$

$$16.26. y'' + y' = e^x/(2 + e^x), \quad y(0) = \ln 27, \quad y'(0) = 1 - \ln 9.$$

$$16.27. y'' + y = 2 \operatorname{ctg} x, \quad y(\pi/2) = 1, \quad y'(\pi/2) = 2.$$

$$16.28. y'' - 3y' + 2y = 1/(1 + e^{-x}), \quad y(0) = 1 + 2\ln 2, \quad y'(0) = 3\ln 2.$$

$$16.29. y'' - 3y' + 2y = e^x/(1 + e^{-x}), \quad y(0) = 0, \quad y'(0) = 0.$$

$$16.30. y'' + y = 1/\sin x, \quad y(\pi/2) = 1, \quad y'(\pi/2) = \pi/2.$$

$$16.31. y'' + y = 1/\cos x, \quad y(0) = 1, \quad y'(0) = 0.$$