Практическое задание №3 Дифференциальные уравнения

Практическое задание выполняется студентами в соответствии с начальной буквой фамилии:

А - Б - 1 вариант   О - Р - 6 вариант
В - Г - 2 вариант   П - Р - 7 вариант
Д - Ж - 3 вариант   С - У - 8 вариант
З - К - 4 вариант   Ф - Ц - 9 вариант
Л - Н - 5 вариант   Ч - Щ - 10 вариант
                      Э - Я - 11 вариант

Вариант №1

1) $(x + xy^2)dx + (y - x^2 y)dy = 0$

2) $xy' - y = \sqrt{x^2 + y^2}$

3) $xdx + ydy = (x^2 + y^2)dx$

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

5) $yy'ctgx - \sin x(1 - y^2) = 0$

6) $y^{(5)} - \dfrac{1}{x} y^{(4)} = 0$

7) $yy'' - (y')^2 = y'$

8) $y''' + y'' - y' - y = xe^x - \sin x$

9) $y'' + y = \dfrac{1}{\sin x}$

10) $\begin{cases} \dfrac{dx}{dt} = 4x - y \\ \dfrac{dy}{dt} = x + 2y \end{cases}, \ x(0) = -1, \ y(0) = 0.$

Вариант №2

1) $y'tgx = y^2 - 3y + 2$

2) $(x + y)dx + (y - x)dy = 0$

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

4) $y \sin x + y' \cos x = 1$

5) $xy(xy^2 + 1)dy - dx = 0$

6) $y'' + (y')^2 = x(y')^2$

7) $(1 + x^2)y'' + (y')^2 + 1 = 0$

8) $y''' - 2y'' + y' = 2e^x + \cos 3x$

9) $y'' + 25y = ctg5x$

10) $\begin{cases} \dfrac{dx}{dt} = 6x - y \\ \dfrac{dy}{dt} = 3x + 2y \end{cases}, \ x(0) = 1, \ y(0) = -1.$

Вариант №3

1) $y' = e^{x-y}$

2) $xy' = y\ln\dfrac{y}{x}$

3) $(2x\cos y - y^2\sin x)dx + (2y\cos x - x^2\sin y)dy = 0$

4) $y' - y\,ctgx = 2x\sin x$

5) $xdy + ydx = y^2dx$

6) $y'' = \dfrac{y'}{x} + \dfrac{x^2}{y'}$

7) $\dfrac{1}{2}y'' = e^{4y}$

8) $y^{(4)} - 2y'' + y = 3e^{2x} + 4\sin x$

9) $y'' - 2y' + y = e^x\ln x$

10) $\begin{cases} \dfrac{dx}{dt} = 2x - 9y \\ \dfrac{dy}{dt} = x + 8y \end{cases}$, $x(0) = -2$, $y(0) = -1$.

Вариант №4

1) $y' = \dfrac{3x - 4y - 2}{3x - 4y - 3}$

2) $y' = \dfrac{y}{x} + \dfrac{y^2}{x^3}$

3) $\dfrac{2x(1 - e^y)}{(1 + x^2)^2}dx + \left(\dfrac{e^y}{1 + x^2} + 1\right)dy = 0$

4) $y' + 5y = 10x + 2$

5) $2xyy' - y^2 + x = 0$

6) $y'' - ctgx\cdot y' = ctgx$

7) $6yy'' - 5(y')^2 = 0$

8) $y''' + 4y' = x - 3\sin 2x$

9) $3y'' - 6y' + 3y = \dfrac{e^x}{x}$

10) $\begin{cases} \dfrac{dx}{dt} = x - y \\ \dfrac{dy}{dt} = 4x - 3y \end{cases}$, $x(0) = 0$, $y(0) = -2$.

Вариант №5

1) $(xy^2 + x)dx + (x^2y - y)dy = 0$

2) $y' = \dfrac{1 - 3x - 3y}{1 + x + y}$

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

4) $y' = \dfrac{y}{x + y^3}$

5) $y' + \dfrac{y}{x} = xy^2$

6) $xy'' = 2y' - x$

7) $yy'' = (y')^2$

8) $y^{(4)} - y''' - 2y'' = 3x + \cos 3x$

9) $2y'' - 4y' + 2y = \dfrac{e^x}{x}$

10) $\begin{cases} \dfrac{dx}{dt} = 2x - 3y \\ \dfrac{dy}{dt} = 3x + 2y \end{cases}$, $x(0) = 0$, $y(0) = -1$.

Вариант №6

1) $\operatorname{tg} y dx - \operatorname{ctg} x dy = 0$

2) $(y^2 - x^2)y' + 2xy = 0$

3) $\left(\dfrac{1}{y} - \dfrac{y}{x^2} \right)dx - \left(\dfrac{x}{y^2} - \dfrac{1}{x} \right)dy = 0$

4) $y' + \dfrac{2y}{x} = x^3$

5) $xy' - y^2 \ln x + y = 0$

6) $xy'' + y' = 1 + x$

7) $2(y')^2 = y''(y - 1)$

8) $y^{(4)} + 9y'' = x^2 + 2\cos 3x$

9) $y'' + 4y = tg 2x$

10) $\begin{cases} \dfrac{dx}{dt} = 2x + y \\ \dfrac{dy}{dt} = -6x - 3y \end{cases}$, $x(0) = -2$, $y(0) = 1$.

Вариант №7

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

2) $y' = \dfrac{3x + y - 1}{x - y - 7}$

3) $\left(\sqrt{y} - \dfrac{y}{3\sqrt[3]{x^4}} \right) dx + \left(\dfrac{x}{2\sqrt{y}} + \dfrac{1}{\sqrt[3]{x}} \right) dy = 0$

4) $y' = y + \sin x$

5) $y' - \dfrac{y}{1 + x} + y^2 = 0$

6) $xy'' = y' \ln \dfrac{y'}{x}$

7) $y'' + (y')^2 = 1$

8) $y'' + 4y' + y = x \left(e^{-2x} - 3 \right)$

9) $y'' + 4y = \dfrac{1}{\cos^2 x}$

10) $\begin{cases} \dfrac{dx}{dt} - x + y = 0 \\ \dfrac{dy}{dt} + 4x - 4y = 0 \end{cases}$, $\quad x(0) = -1, \ y(0) = 0.$

Вариант №8

1) $(4y + 2x + 3) y' - 2y - x - 1 = 0$

2) $x(\ln x - \ln y) dy - y dx = 0$

3) $y \cdot x^{y-1} dx + x^y \ln x \, dy = 0$

4) $y' + 3y = e^{2x}$

5) $y' - \dfrac{3y}{x} + x^3 y^2 = 0$

6) $y'' - 2 \,ctg x \cdot y' = \sin^3 x$

7) $y'' - 5(y')^2 tg 5y = 0$

8) $y'' - 5y' - 6y = \sin 2x - x^2 e^{-x}$

9) $y'' + 16y = \sin^3 x$

10) $\begin{cases} \dfrac{dx}{dt} + 2y = x \\ \dfrac{dy}{dt} = x - y \end{cases}$, $\quad x(0) = 1, \ y(0) = -2.$

Вариант №9

1) $(1 + y^2)dx - y\sqrt{1 - x^2}\,dy = 0$

2) $y' = \left(1 + \dfrac{y-1}{2x}\right)^2$

3) $2x\cos^2 y\,dx - (x^2 - 3)\sin 2y\,dy = 0$

4) $xy' - \dfrac{y}{x+1} - x = 0$

5) $xy' + y = xy^2 \ln x$

6) $xy'' - y' \ln \dfrac{y'}{x} = 0$

7) $y'' + \dfrac{2}{1-y}(y')^2 = 0$

8) $y^{(6)} - y^{(4)} = 1$

9) $y'' - 2y' + y = \dfrac{e^x}{\sqrt{9 - x^2}}$

10) $\begin{cases} \dfrac{dx}{dt} = 2x - y \\ \dfrac{dy}{dt} = 4x - 2y \end{cases}$, $\quad x(0) = -1, \ y(0) = 0.$

Вариант №10

1) $y' = \dfrac{x + 2y + 1}{2x + 4y + 3}$

2) $xy' = y \cdot \cos^2 \ln \dfrac{y}{x}$

3) $(e^y + 1)dx + xe^y dy = 0$

4) $y' - y\,\mathrm{tg}\,x = \dfrac{1}{\cos x}$

5) $(y^2 - x^2)y' + 2xy = 0$

6) $y'' + \dfrac{1}{x}y' = \dfrac{1}{x^3}$

7) $yy'' + (y')^2 = 0$

8) $y^{(4)} + 5y'' + 4y = \sin 2x - \cos x$

9) $y'' + 2y' + y = \dfrac{e^{-x}}{\sqrt{1 - x^2}}$

10) $\begin{cases} \dfrac{dx}{dt} = 4x - y \\ \dfrac{dy}{dt} = x + 2y \end{cases}$, $\quad x(0) = -2, \ y(0) = 0.$

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Вариант №11

1) $xyy' = 1 - x^2$

2) $(x - y)ydx - x^2dy = 0$

3) $2xydx + (x^2 - e^y)dy = 0$

4) $y'(x + \sin y) = 1$

5) $ydx + (2\sqrt{xy} - x)dy = 0$

6) $xy'' = 2y' - x$

7) $yy'' + (y')^2 = yy'$

8) $y^{(4)} - 16y = x^2 - e^x$

9) $y'' + y = ctg x$

10) $\begin{cases} \dfrac{dx}{dt} = x + y \\ \dfrac{dy}{dt} = -2x + 4y \end{cases}$, $x(0) = 0, \ y(0) = 1.$

Вариант №12

1) $ydx + (\sqrt{xy} - \sqrt{x})dy = 0$

2) $y' = \dfrac{y}{x} - x \sin x \, ctg \dfrac{y}{x}$

3) $ydx + (x + 6y^2)dy = 0$

4) $y = x(y' - x\cos x)$

5) $y' + 2y = e^x \cdot y^2$

6) $y'' + (y')^2 = x(y')^2$

7) $yy'' = (y')^2 - (y')^3$

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

9) $y'' - y = \dfrac{1}{e^{2x} + 1}$

10) $\begin{cases} \dfrac{dx}{dt} = x - y \\ \dfrac{dy}{dt} = -4x + 4y \end{cases}$, $x(0) = -1, \ y(0) = 2.$

Вариант №13

1) $\cos^2 x \cdot yy' = x$ 2) $(x - y)ydx - x^2 dy = 0$

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

4) $y' + 3y = e^{2x}$ 5) $xy' - y = y^3$

6) $x^2 y''' + 2xy'' - 1 = 0$ 7) $(y')^2 + 2yy'' = 0$

8) $y''' + 9y' = x^2 - \sin 3x$ 9) $y'' + y = tgx$

10) $\begin{cases} \dfrac{dx}{dt} = -x - 2y \\ \dfrac{dy}{dt} = 3x + 4y \end{cases}$, $x(0) = -1, \;\; y(0) = 0.$

Вариант №14

1) $(1 + x^2)y' + y\sqrt{1 + x^2} = xy, \;\; y(0) = 1.$ 2) $y + \sqrt{x^2 + y^2} - xy' = 0$

3) $\left(4 - \dfrac{y^2}{x^2} \right)dx + \dfrac{2y}{x} dy = 0$ 4) $y'\cos x - y \sin x = \sin 2x$

5) $y' - xy = -y^3 e^{x^2}$ 6) $xy'' - y' = e^x \cdot x^2$

7) $y'' tgy = 2(y')^2$ 8) $y^{(4)} - 81y = 27 e^{-3x}$

9) $y'' - 4y' + 5y = \dfrac{e^{2x}}{\cos x}$ 10) $\begin{cases} \dfrac{dx}{dt} = 2x - y \\ \dfrac{dy}{dt} = x + 2y \end{cases}$, $x(0) = -1, \;\; y(0) = 0.$

Вариант №15

1) $y' = 2\sqrt{y}\ln x$, $y(e) = 1$.

2) $xy'\cos\dfrac{y}{x} = y\cos\dfrac{y}{x} - x$

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

4) $xy' + y = \ln x + 1$

5) $3y^2 y' + y^3 = x + 1$

6) $y''x\ln x = y'$

7) $2yy'' = 1 + (y')^2$

8) $y''' + y'' = 6x + e^{-x}$

9) $y'' + 4y' + 4y = \dfrac{e^{-2x}}{x^3}$

10) $\begin{cases} \dfrac{dx}{dt} = x + y \\ \dfrac{dy}{dt} = -5x - 3y \end{cases}$, $x(0) = 1$, $y(0) = 0$.

Вариант №16

1) $y' = \sqrt{2y + 3}\,tgx$

2) $y' = \dfrac{y^2 - 4x^2}{xy}$

3) $y' - \dfrac{y}{x^2} = \sqrt{x}\cdot e^{-\frac{1}{x}}$

4) $y' - \dfrac{y}{x} + \dfrac{x}{y^2} = 0$

5) $\dfrac{y}{x}dx + (\ln x + \cos y)dy = 0$

6) $y'' + y(y')^3 = 0$

7) $(1 + x^2)y'' + (y')^2 + 1 = 0$

8) $y'' - 6y' + 9y = \sin 2x$

9) $y'' + \dfrac{y}{4} = \dfrac{1}{4}ctg\dfrac{x}{2}$

10) $\begin{cases} \dfrac{dx}{dt} = 3x + 2y \\ \dfrac{dy}{dt} = x + 2y \end{cases}$

Вариант №17

1) $y' = \sqrt{y^2 + 2y - 2} \cdot \dfrac{x}{\cos^2(x^2)}$

2) $y' = \dfrac{y + x\sin^2\dfrac{y}{x}}{x}$

3) $y' - xy = x$

4) $y' + \dfrac{y}{x} - \dfrac{x}{y} = 0$

5) $\dfrac{y^2}{2\sqrt{x}} dx + 2\sqrt{x} \cdot y dy = 0$

6) $y''(y')^2 = 2y, \; y(1) = 2, \; y'(1) = 2$

7) $xy'' - y' = 0$

8) $y'' + 4y' + 20y = xe^x$

9) $y'' + 4y = ctg\,2x$

10) $\begin{cases} \dfrac{dx}{dt} = 3x + y \\ \dfrac{dy}{dt} = x + 3y \end{cases}$

Вариант №18

1) $y' = \dfrac{\sqrt[4]{3x - 1}}{y^3 \sin(y^4)}$

2) $y' = \dfrac{x^2 + xy + 4y^2}{x^2}$

3) $y' = xy + e^{\frac{x^2}{2}}$

4) $y' - \dfrac{y}{x} = \dfrac{x^2}{y}$

5) $\dfrac{1}{2\sqrt{x} \cdot y} dx - \dfrac{\sqrt{x}}{y^2} dy = 0$

6) $y''y^2 - 4y' = 0, \; y(1) = 1, \; y'(1) = -4$

7) $y''' = xe^{-x}$

8) $y'' + 4y' + 3y = xe^{-x}$

9) $y'' - 8y' + 16y = \dfrac{e^{4x}}{x^3}$

10) $\begin{cases} \dfrac{dx}{dt} = 4x + 2y \\ \dfrac{dy}{dt} = 2x + 4y \end{cases}$

Вариант №19

1) $y' = \sqrt[3]{(3y+1)^2} \cdot ctgx$

2) $y' = \dfrac{y\left(1 - \ln^2\left(\dfrac{y}{x}\right)\right)}{x}$

3) $y' + tgx \cdot y = \cos^2 x$

4) $y' - y = y^3$

5) $(x + 2xy)dx + x^2 dy = 0$

6) $y''y + (y')^2 = 0$

7) $xy'' = 2x - y'$

8) $y'' - 3y' + 2y = xe^x$

9) $y'' + y = \dfrac{1}{\cos x}$

10) $\begin{cases} \dfrac{dx}{dt} = 2x + 3y \\ \dfrac{dy}{dt} = x + 4y \end{cases}$

Вариант №20

1) $y' = \dfrac{\sin^2 x \cos x}{\sqrt[3]{2 - 5y}}$

2) $y' = \dfrac{x(x + y) + y^2}{x^2}$

3) $y' + \dfrac{y}{x} = x^4$

4) $y' - y = \dfrac{2}{y^2}$

5) $\dfrac{2x}{y}dx - \dfrac{x^2}{y^2}dy = 0$

6) $y''y' = 18y, \ \ y(5) = 1, \ \ y'(5) = 3.$

7) $2xy'' - y' = 0$

8) $y'' - 6y' + 5y = \cos x$

9) $y'' + y = \dfrac{1}{\sin x}$

10) $\begin{cases} \dfrac{dx}{dt} = 2x + 4y \\ \dfrac{dy}{dt} = 4x + 2y \end{cases}$

Вариант №21

1) $y' = tgy \cdot \dfrac{\ln^3 x}{x}$

2) $y' = \dfrac{y + y\ln^3 \dfrac{y}{x}}{x}$

3) $y' - tgx \cdot y = \sin^3 x$

4) $y' + xy = xy^2$

5) $xy^2 dx + (x^2 y + \cos y)dy = 0$

6) $yy'' - 3yy' - \dfrac{(y')^2}{2}$

7) $y''ctgx - 2y' - 2 = 0$

8) $y'' - 4y' + 3y = \sin 2x$

9) $y'' - y = \dfrac{e^{-x}}{2 + e^{-x}}$

10) $\begin{cases} \dfrac{dx}{dt} = 3x + 3y \\ \dfrac{dy}{dt} = 2x + 4y \end{cases}$

Вариант №22

1) $y' = \dfrac{\sqrt{y^2 + 4y + 1}}{\sin^2(1 - 2x)}$

2) $y' = \dfrac{x(y + 9x) - y^2}{x^2}$

3) $y' = \dfrac{y}{x} + x \cdot \sqrt[3]{x}$

4) $y' - y = y^3$

5) $\dfrac{1}{y} dx - \dfrac{x}{y^2} dy = 0$

6) $y'' = 2yy'$

7) $y'' - x\sqrt{y'} = 0$

8) $y'' + 4y' + 13y = xe^x$

9) $y'' + y = ctgx$

10) $\begin{cases} \dfrac{dx}{dt} = 5x - 4y \\ \dfrac{dy}{dt} = -4x + 5y \end{cases}$

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Вариант №23

1) $y' = \sqrt[3]{2y+3} \cdot x^2 \cos(x^3)$

2) $y' = \dfrac{x^2 + y^2}{xy}$

3) $y' + \dfrac{y}{x} = \sqrt[3]{x}$

4) $y' + 2y = \dfrac{1}{y^2}$

5) $3x^2 y^2 dx + 2x^3 y \, dy = 0$

6) $y''y = (y')^2$

7) $xy'' = y' \ln \dfrac{y'}{x}$

8) $y'' - 3y' + 2y = x^2 + e^x$

9) $y'' + 16y = \dfrac{16}{\sin 4x}$

10) $\begin{cases} \dfrac{dx}{dt} = -3x + y \\ \dfrac{dy}{dt} = x - 3y \end{cases}$

Вариант №24

1) $y' = \dfrac{x^2 \cdot \sqrt{y}}{\sqrt{1 - x^6}}$

2) $y' = \dfrac{y + x \, ctg \dfrac{y}{x}}{x}$

3) $y' - \dfrac{y}{x} = \sqrt{x}$

4) $y' - 3y = \sqrt{y}$

5) $2x\sqrt{y}\,dx + \dfrac{x^2}{2\sqrt{y}}\,dy = 0$

6) $y''y - 2(y')^2 = 0$

7) $y' = (x-1)y''$

8) $y'' + y' = xe^{-x}$

9) $y'' - 6y' + 8y = \dfrac{4}{2 + e^{-2x}}$

10) $\begin{cases} \dfrac{dx}{dt} = 2x + 5y \\ \dfrac{dy}{dt} = 5x + 2y \end{cases}$

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Вариант №25

1) $y' = \cos^2(3y - 1)\dfrac{\ln^3 x}{x}$

2) $y' = \dfrac{9x^3 + xy(x + y)}{x^3}$

3) $y' + xy = x^3 e^{-\frac{x^2}{2}}$

4) $y' - \dfrac{y}{x} - xy^2 = 0$

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

6) $y'' - y\sqrt{y'} = 0, \ \ y(0) = 6, \ \ y'(0) = 9$

7) $y''(e^x + 1) + y' = 0$

8) $y'' + 2y' + y = 2xe^{-x}$

9) $y'' + \dfrac{y}{4} = \dfrac{1}{4} ctg\dfrac{x}{2}$

10) $\begin{cases} \dfrac{dx}{dt} = x - 2y \\ \dfrac{dy}{dt} = -2x + y \end{cases}$

Вариант №26

1) $y' = y^3 \cos^2 x \cdot \sin x$

2) $y' = \dfrac{y + x\sqrt{1 + \dfrac{y^2}{x^2}}}{x}$

3) $y' - \dfrac{y}{x^2} = xe^{-\frac{1}{x}}$

4) $y' - \dfrac{y}{x} - \dfrac{y^2}{x^2} = 0$

5) $(2x + y)dx + xdy = 0$

6) $4(y')^2 + yy'' = 0$

7) $y'' + y' = xy''$

8) $y'' - 5y' + 6y = 2\cos x + \sin x$

9) $y'' + 3y' + 2y = \dfrac{e^{-x}}{2 + e^{-x}}$

10) $\begin{cases} \dfrac{dx}{dt} = 2x + 3y \\ \dfrac{dy}{dt} = 3x + 2y \end{cases}$

Вариант №27

1) $y' = \sqrt{y}\,\dfrac{\ln x}{x}$

2) $y' = \dfrac{y + x\sqrt{\dfrac{2x+y}{x}}}{x}$

3) $y' + x^2 y = 3x^2 e^{-\frac{x^3}{3}}$

4) $y' + y^2 x - \dfrac{y}{x} = 0$

5) $\dfrac{2x}{y^3}dx - \left(\dfrac{3x^2}{y^4} + y^3\right)dy = 0$

6) $yy'' - (y')^2 \ln\left(\dfrac{y'}{4}\right) = 0$

7) $y'' - \dfrac{y'}{x} = x$

8) $y'' - 7y' + 12y = (x+1)e^{3x}$

9) $y'' - 3y' = \dfrac{9e^{-3x}}{3 + e^{-3x}}$

10) $\begin{cases} \dfrac{dx}{dt} = x + 3y \\ \dfrac{dy}{dt} = 3x + y \end{cases}$

Вариант №28

1) $y' = \dfrac{\sin^2(2 - 4y)}{x^2 + 4x + 8}$

2) $y' = \dfrac{16x^3 + xy(x+y)}{x^3}$

3) $y' - xy = \sqrt{x}\,e^{\frac{x^2}{2}}$

4) $y' - \dfrac{y}{x} + x^2 y^2 = 0$

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

6) $(y')^2 + 2yy'' = 0$

7) $y'' = \sqrt{xy'}$

8) $y'' - 4y' + 3y = \cos 2x - \sin 2x$

9) $y'' - 3y' + 2y = \dfrac{1}{3 + e^{-x}}$

10) $\begin{cases} \dfrac{dx}{dt} = 2x - y \\ \dfrac{dy}{dt} = -x + 2y \end{cases}$

Вариант №29

1) $y' = \sqrt[3]{2y+1} \dfrac{x}{9+x^2}$

2) $y' = \dfrac{y^2 - x^2}{xy}$

3) $y' + xy = \sqrt{2x+1} \cdot e^{-\frac{x^2}{2}}$

4) $y' + \dfrac{y}{x} - xy^3 = 0$

5) $y^2 \cos x dx + 2y \sin x dy = 0$

6) $y'' = y' e^y$

7) $y'' = \dfrac{\sqrt{y'}}{x}, \quad y(1) = 1, \quad y'(1) = 0$

8) $y'' + 3y' - 4y = (2x+1)e^x$

9) $y'' + \pi^2 y = \dfrac{\pi^2}{\sin \pi x}$

10) $\begin{cases} \dfrac{dx}{dt} = x - 3y \\ \dfrac{dy}{dt} = -3x + y \end{cases}$

Вариант №30

1) $y' = ctg y \cdot \sqrt[3]{4x-1}$

2) $y' = \dfrac{3x^2 + y^2}{xy}$

3) $y' - x^2 y = x^2 e^{\frac{x^3}{3}}$

4) $y' + \dfrac{y}{x} + x^2 y^3 = 0$

5) $-\dfrac{y^2}{x^2} dx + \left(\dfrac{2y}{x} + y^4 \right) dy = 0$

6) $(y')^2 + 2yy'' = 0$

7) $y'' + \dfrac{\sqrt{y'}}{x^2} = 0$

8) $y'' + 5y' - 6y = 3\cos 2x$

9) $y'' + \dfrac{1}{\pi^2} y = \dfrac{1}{\pi^2 \cos \dfrac{x}{\pi}}$

10) $\begin{cases} \dfrac{dx}{dt} = 3x + 4y \\ \dfrac{dy}{dt} = 4x + 3y \end{cases}$