Варіант 1

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

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

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

4. $y'' + 2y' = 4e^x (\sin x + \cos x)$.

5. $4x\,dx - 3y\,dy = 3x^2 y\,dy - 2xy^2\,dx$.

6. $y' - \dfrac{y}{x} = x^2$, $y(1) = 0$.

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

8. $y'' + y' - 6y = (6x + 1)e^{3x}$.

Варіант 2

1. $y'' + 16y = 8\cos 4x$.

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

3. $y' - y\,\mathrm{ctg}\,x = 2x\sin x$, $y\left(\dfrac{\pi}{2}\right) = 0$.

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

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

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

7. $\begin{cases} \dfrac{dx}{dt} = 2x + y, \\ \dfrac{dy}{dt} = -6x - 3y. \end{cases}$.

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

Варіант 3

1. $y' = \dfrac{x + y}{x - y}$.

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

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

4. $y'' + 2y' = -2e^x (\sin x + \cos x)$.

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

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

7. $2xy'' = y'$.

8. $y'' - y = (14 - 16x)e^{-x}$.

Варіант 4

1. $y'' + 2y' = 6x^2 + 2x + 1$, $y(0) = 2$, $y'(0) = 2$.

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

3. $y' + y\,\mathrm{tg}\,x = \cos^2 x$, $y\left(\dfrac{\pi}{4}\right) = \dfrac{1}{2}$.

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

5. $y'' + y = 2\cos 7x + 3\sin 7x$.

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

7. $\begin{cases} \dfrac{dx}{dt} = -2x + y, \\ \dfrac{dy}{dt} = -3x + 2y. \end{cases}$.

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

Варіант 5

1. $2y' = \dfrac{y^2}{x^2} + 6\dfrac{y}{x} + 3$.

2. $\begin{cases} \dfrac{dx}{dt} = 8x - 3y, \\ \dfrac{dy}{dt} = 2x + y. \end{cases}$

3. $y'' = 32\sin^3 y \cos y,\ y(1) = \dfrac{\pi}{2},\ y'(1) = 4$.

4. $y'' + 2y' + 5y = -\sin 2x$.

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

6. $y' - \dfrac{y}{x+2} = x^2 + 2x,\ y(-1) = \dfrac{3}{2}$.

7. $y'' \operatorname{tg} x - y' + \dfrac{1}{\sin x} = 0$.

8. $y'' + 4y' = \left(24\cos 2x + 2\sin 2x\right)e^x$.

Варіант 6

1. $-5y'' + 8y' - 4y = \left(2x - 5\right)e^x$.

2. $x^2 y'' + x\,y' = 1$.

3. $y' - \dfrac{1}{x+1}y = e^x\left(x+1\right),\ y\left(0\right) = 1$.

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

5. $y'' - 4y' + 8y = e^x\left(5\sin x - 3\cos x\right)$.

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

7. $\begin{cases} \dfrac{dx}{dt} = 4x + 2y, \\ \dfrac{dy}{dt} = 4x + 6y. \end{cases}$

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

Варіант 7

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

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

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

4. $y'' + 2y' = e^x\left(\sin x + \cos x\right)$.

5. $\left(e^{2x} + 5\right)dy + e^{2x} y\,dx = 0$.

6. $y' - \dfrac{y}{x} = x\sin x,\ y\left(\dfrac{\pi}{2}\right) = 1$.

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

8. $y'' + 2y' + 2y = 2x^2 + 8x + 6,\ y(0) = 1,\ y'(0) = 4$.

Варіант 8

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

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

3. $y' + \dfrac{y}{x} = \sin x,\ y\left(\pi\right) = \dfrac{1}{\pi}$.

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

5. $y'' - 4y' + 4y = e^{2x}\sin 3x$.

6. $4y^3 y'' = 16y^4 - 1,\ y(0) = \dfrac{\sqrt{2}}{2},\ y'(0) = \dfrac{1}{\sqrt{2}}$.

7. $\begin{cases} \dfrac{dx}{dt} = -x + 8y, \\ \dfrac{dy}{dt} = x + y. \end{cases}$

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

Варіант 9

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

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

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

4. $y'' + 2y' = 4e^x \left(\sin x + \cos x \right)$.

5. $4x\,dx - 3y\,dy = 3x^2 y\,dy - 2xy^2\,dx$.

6. $y' - \dfrac{y}{x} = x^2$, $y(1) = 0$.

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

8. $y'' + y' - 6y = \left(6x + 1 \right) e^{3x}$.

Варіант 10

1. $y'' + 16y = 8\cos 4x$.

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

3. $y' - y\,\mathrm{ctg}\,x = 2x \sin x$, $y\left(\dfrac{\pi}{2} \right) = 0$.

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

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

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

7. $\begin{cases} \dfrac{dx}{dt} = 2x + y, \\ \dfrac{dy}{dt} = -6x - 3y. \end{cases}$.

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

Варіант 11

1. $y' = \dfrac{x + y}{x - y}$.

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

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

4. $y'' + 2y' = -2e^x \left(\sin x + \cos x \right)$.

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

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

7. $2xy'' = y'$.

8. $y'' - y = \left(14 - 16x \right) e^{-x}$.

Варіант 12

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

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

3. $y' + y\,\mathrm{tg}\,x = \cos^2 x$, $y\left(\dfrac{\pi}{4} \right) = \dfrac{1}{2}$.

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

5. $y'' + y = 2\cos 7x + 3\sin 7x$.

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

7. $\begin{cases} \dfrac{dx}{dt} = -2x + y, \\ \dfrac{dy}{dt} = -3x + 2y. \end{cases}$.

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

Варіант 13

1. $2y' = \dfrac{y^2}{x^2} + 6\dfrac{y}{x} + 3$.

2. $\begin{cases} \dfrac{dx}{dt} = 8x - 3y, \\ \dfrac{dy}{dt} = 2x + y. \end{cases}$

3. $y'' = 32\sin^3 y\cos y,\ y(1) = \dfrac{\pi}{2},\ y'(1) = 4$.

4. $y'' + 2y' + 5y = -\sin 2x$.

5. $6xdx - 6ydy = 2x^2 ydy - 3xy^2 dx$.

6. $y' - \dfrac{y}{x+2} = x^2 + 2x,\ y(-1) = \dfrac{3}{2}$.

7. $y''\operatorname{tg} x - y' + \dfrac{1}{\sin x} = 0$.

8. $y'' + 4y' = \left(24\cos 2x + 2\sin 2x\right)e^x$.

Варіант 14

1. $-5y'' + 8y' - 4y = \left(2x - 5\right)e^x$.

2. $x^2 y'' + x\, y' = 1$.

3. $y' - \dfrac{1}{x+1}y = e^x\left(x+1\right),\ y(0) = 1$.

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

5. $y'' - 4y' + 8y = e^x\left(5\sin x - 3\cos x\right)$.

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

7. $\begin{cases} \dfrac{dx}{dt} = 4x + 2y, \\ \dfrac{dy}{dt} = 4x + 6y. \end{cases}$

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

Варіант 15

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

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

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

4. $y'' + 2y' = e^x\left(\sin x + \cos x\right)$.

5. $\left(e^{2x} + 5\right)dy + e^{2x}ydx = 0$.

6. $y' - \dfrac{y}{x} = x\sin x,\ y\left(\dfrac{\pi}{2}\right) = 1$.

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

8. $y'' + 2y' + 2y = 2x^2 + 8x + 6,\ y(0) = 1,\ y'(0) = 4$.

Варіант 16

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

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

3. $y' + \dfrac{y}{x} = \sin x,\ y\left(\pi\right) = \dfrac{1}{\pi}$.

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

5. $y'' - 4y' + 4y = e^{2x}\sin 3x$.

6. $4y^3 y'' = 16y^4 - 1,\ y(0) = \dfrac{\sqrt{2}}{2},\ y'(0) = \dfrac{1}{\sqrt{2}}$.

7. $\begin{cases} \dfrac{dx}{dt} = -x + 8y, \\ \dfrac{dy}{dt} = x + y. \end{cases}$

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

Варіант 17

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

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

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

4. $y'' + 2y' = 4e^x \left(\sin x + \cos x \right)$.

5. $4xdx - 3ydy = 3x^2 ydy - 2xy^2 dx$.

6. $y' - \dfrac{y}{x} = x^2$, $y(1) = 0$.

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

8. $y'' + y' - 6y = \left(6x + 1 \right) e^{3x}$.

Варіант 18

1. $y'' + 16y = 8\cos 4x$.

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

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

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

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

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

7. $\begin{cases} \dfrac{dx}{dt} = 2x + y, \\ \dfrac{dy}{dt} = -6x - 3y. \end{cases}$.

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

Варіант 19

1. $y' = \dfrac{x + y}{x - y}$.

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

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

4. $y'' + 2y' = -2e^x \left(\sin x + \cos x \right)$.

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

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

7. $2xy'' = y'$.

8. $y'' - y = \left(14 - 16x \right) e^{-x}$.

Варіант 20

1. $y'' + 2y' = 6x^2 + 2x + 1$, $y(0) = 2$, $y'(0) = 2$.

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

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

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

5. $y'' + y = 2\cos 7x + 3\sin 7x$.

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

7. $\begin{cases} \dfrac{dx}{dt} = -2x + y, \\ \dfrac{dy}{dt} = -3x + 2y. \end{cases}$.

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

Варіант 21

1. $2y' = \dfrac{y^2}{x^2} + 6\dfrac{y}{x} + 3$.

2. $\begin{cases} \dfrac{dx}{dt} = 8x - 3y, \\ \dfrac{dy}{dt} = 2x + y. \end{cases}$

3. $y'' = 32\sin^3 y \cos y$, $y(1) = \dfrac{\pi}{2}$, $y'(1) = 4$.

4. $y'' + 2y' + 5y = -\sin 2x$.

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

6. $y' - \dfrac{y}{x+2} = x^2 + 2x$, $y(-1) = \dfrac{3}{2}$.

7. $y''\operatorname{tg} x - y' + \dfrac{1}{\sin x} = 0$.

8. $y'' + 4y' = (24\cos 2x + 2\sin 2x)e^x$.

Варіант 22

1. $-5y'' + 8y' - 4y = (2x - 5)e^x$.

2. $x^2 y'' + x\, y' = 1$.

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

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

5. $y'' - 4y' + 8y = e^x(5\sin x - 3\cos x)$.

6. $y'' = 98y^3$, $y(1) = 1$, $y'(1) = 7$.

7. $\begin{cases} \dfrac{dx}{dt} = 4x + 2y, \\ \dfrac{dy}{dt} = 4x + 6y. \end{cases}$

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

Варіант 23

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

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

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

4. $y'' + 2y' = e^x(\sin x + \cos x)$.

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

6. $y' - \dfrac{y}{x} = x\sin x$, $y\left(\dfrac{\pi}{2}\right) = 1$.

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

8. $y'' + 2y' + 2y = 2x^2 + 8x + 6$, $y(0) = 1$, $y'(0) = 4$.

Варіант 24

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

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

3. $y' + \dfrac{y}{x} = \sin x$, $y(\pi) = \dfrac{1}{\pi}$.

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

5. $y'' - 4y' + 4y = e^{2x}\sin 3x$.

6. $4y^3 y'' = 16y^4 - 1$, $y(0) = \dfrac{\sqrt{2}}{2}$, $y'(0) = \dfrac{1}{\sqrt{2}}$.

7. $\begin{cases} \dfrac{dx}{dt} = -x + 8y, \\ \dfrac{dy}{dt} = x + y. \end{cases}$

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

Варіант 25

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

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

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

4. $y'' + 2y' = 4e^x (\sin x + \cos x)$.

5. $4x\,dx - 3y\,dy = 3x^2 y\,dy - 2xy^2\,dx$.

6. $y' - \dfrac{y}{x} = x^2$, $y(1) = 0$.

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

8. $y'' + y' - 6y = (6x + 1)e^{3x}$.

Варіант 26

1. $y'' + 16y = 8\cos 4x$.

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

3. $y' - y\,\mathrm{ctg}\,x = 2x\sin x$, $y\left(\dfrac{\pi}{2}\right) = 0$.

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

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

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

7. $\begin{cases} \dfrac{dx}{dt} = 2x + y, \\ \dfrac{dy}{dt} = -6x - 3y. \end{cases}$

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

Варіант 27

1. $y' = \dfrac{x + y}{x - y}$.

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

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

4. $y'' + 2y' = -2e^x (\sin x + \cos x)$.

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

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

7. $2xy'' = y'$.

8. $y'' - y = (14 - 16x)e^{-x}$.

Варіант 27

1. $y'' + 2y' = 6x^2 + 2x + 1$, $y(0) = 2$, $y'(0) = 2$.

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

3. $y' + y\,\mathrm{tg}\,x = \cos^2 x$, $y\left(\dfrac{\pi}{4}\right) = \dfrac{1}{2}$.

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

5. $y'' + y = 2\cos 7x + 3\sin 7x$.

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

7. $\begin{cases} \dfrac{dx}{dt} = -2x + y, \\ \dfrac{dy}{dt} = -3x + 2y. \end{cases}$

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

Варіант 29

1. $2y' = \dfrac{y^2}{x^2} + 6\dfrac{y}{x} + 3$.

2. $\begin{cases} \dfrac{dx}{dt} = 8x - 3y, \\ \dfrac{dy}{dt} = 2x + y. \end{cases}$

3. $y'' = 32\sin^3 y \cos y, \; y(1) = \dfrac{\pi}{2}, y'(1) = 4$.

4. $y'' + 2y' + 5y = -\sin 2x$.

5. $6xdx - 6ydy = 2x^2 ydy - 3xy^2 dx$.

6. $y' - \dfrac{y}{x+2} = x^2 + 2x, \; y(-1) = \dfrac{3}{2}$.

7. $y'' \operatorname{tg} x - y' + \dfrac{1}{\sin x} = 0$.

8. $y'' + 4y' = \left(24\cos 2x + 2\sin 2x\right)e^x$.

Варіант 30

1. $-5y'' + 8y' - 4y = \left(2x - 5\right)e^x$.

2. $x^2 y'' + x\, y' = 1$.

3. $y' - \dfrac{1}{x+1} y = e^x \left(x+1\right), \; y(0) = 1$.

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

5. $y'' - 4y' + 8y = e^x \left(5\sin x - 3\cos x\right)$.

6. $y'' = 98y^3, \; y(1) = 1, y'(1) = 7$.

7. $\begin{cases} \dfrac{dx}{dt} = 4x + 2y, \\ \dfrac{dy}{dt} = 4x + 6y. \end{cases}$

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