

Some questions of the Differential Equations

Question one: Determine the **Order** and **Degree** of the following functions

1. $\left(\frac{dy}{dt}\right)^2 + y^2 = 1$

2. $\sqrt{1 + \left(\frac{dy}{dx}\right)^2} = 4x$

3. $x^2 \left(\frac{d^2y}{dx^2}\right)^3 + 3 \left(\frac{d^3y}{dx^3}\right)^2 + 7 \frac{dy}{dx} - 4y = 0$

4. $\frac{d^2y}{dx^2} - \sqrt{\frac{dy}{dx}} = 0$

5. $y - \frac{dy}{dx} - 8 = 4(x - 1)^2$

6. $\sqrt{1 + x^2} = \frac{dy}{dx}$

7. $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{2}{3}} = \frac{d^2y}{dx^2}$

8. $\frac{d^2y}{dx^2} - \sqrt{\frac{dy}{dx}} = 0$

9. $(y')^2 - y^2 = \cos(x)$

10. $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{2}{3}} = \frac{d^2y}{dx^2}$

Question two: Solve the following differential equations.

1. $\frac{dy}{dx} = \frac{y}{x + \sqrt{xy}}$

2. $(y \cos x + 2xe^y) + (\sin x + x^2 e^y - 1) \frac{dy}{dx} = 0$

3. $\frac{dy}{dx} + 3x^2y = 4x^2y^2$

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

$$5. \frac{dy}{dx} = \frac{3y^2 + xy}{x^2}$$

$$6. (\cos x + y^2)dx + (2xy)dy = 0$$

$$7. \frac{dy}{dx} + 2y = e^x \sqrt{y}$$

$$8. y'' - y' - 2y = 4x^2$$

$$9. xy - 2y' = 0$$

$$10. 2xy + 6x + (x^2 - 2)y' = 0$$

$$11. \frac{dy}{dx} + \frac{\sin x}{y} = 0 \text{ where } y(0) = 1$$

$$12. y'' + 3y' + 2y = 2x^2 + 4x + 5$$

$$13. \frac{dy}{dx} + \frac{y}{x} = 2$$

$$14. \frac{dy}{dx} - \frac{4y}{x} = x^5 e^x$$

$$15. \frac{dy}{dx} - y = xy^2$$

$$16. \frac{dy}{dx} + 3x^2 y = 4x^2 y^2$$

$$17. \frac{dy}{dx} + 2y = e^x \sqrt{y}$$

$$18. y'' - 5y' + 4y = 0$$

$$19. y'' - 2y' + 5y = 0$$

$$20. (3x^2 y^2 + x^2)dx + (2x^3 y + y^2)dy = 0$$