Page No.:
Date :

Chapter 6: Differential Equations

Exercise 6(A)

1. Determine the order and degree of the following differential equations.

i) $4 \cdot \frac{d^2y}{dx^2} + x = 0$

The given differential equation is:

$$4 \cdot \frac{d^2y}{dx^2} + x = 0$$

Its order is: 2
Its degree is: 1

ii) $\frac{d^2y}{dx^2} - 3\left(\frac{d^2y}{dx^2}\right)^2 + 2y = 0$

The given differential equation is:

$$\frac{d^2y}{dx^2} - 3\left(\frac{d^2y}{dx^2}\right)^2 + 2y = 0$$

Its order is: 2
Its degree is: 2

iii) $y = x \cdot \frac{dy}{dx} + a\sqrt{a + \left(\frac{dy}{dx}\right)^3}$

The given differential equation is:

$$y = x \cdot \frac{dy}{dx} + a\sqrt{a + \left(\frac{dy}{dx}\right)^3}$$

Page No. :
Date :

Squaring both sides,

$$y^2 = x^2 \cdot \left(\frac{dy}{dx}\right)^2 + a^2 \cdot \left[a + \left(\frac{dy}{dx}\right)^3\right]$$

or, $y^2 = x^2 \left(\frac{dy}{dx}\right)^2 + a^3 + a^2 \left(\frac{dy}{dx}\right)^3$

or, $y^2 - x^2 \left(\frac{dy}{dx}\right)^2 = a^3 + a^2 \left(\frac{dy}{dx}\right)^3$

~~or, (y-~~

or, $y - x\frac{dy}{dx} = a \cdot \sqrt{a + \left(\frac{dy}{dx}\right)^3}$

Squaring both sides

$\therefore$ ~~or,~~ $\left(y - x \cdot \frac{dy}{dx}\right)^2 = a^2 \left(a + \left(\frac{dy}{dx}\right)^3\right)$

Its order is : 1
Its degree is : 3

(iv) $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$

The given differential equation is:

$$\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$$

Its order is : 2
Its degree is : 1

Page No. :
Date :

v) $y = x\cdot\frac{dy}{dx} + \sqrt{a^2\left(\frac{dy}{dx}\right)^2 + b^2}$

The given differential equation is

$$y = x\cdot\frac{dy}{dx} + \sqrt{a^2\left(\frac{dy}{dx}\right)^2 + b^2}$$

$$\text{or, } y - x\cdot\frac{dy}{dx} = \sqrt{a^2\left(\frac{dy}{dx}\right)^2 + b^2}$$

Squaring both sides.

$$\text{or, } \left(y - x\cdot\frac{dy}{dx}\right)^2 = a^2\left(\frac{dy}{dx}\right)^2 + b^2$$

Its order is : 1
Its degree is : 2

---

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

The given differential equation is

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

Its order is : 2
Its degree is : 1

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

The given differential equation is:

$$1+\left(\frac{dy}{dx}\right)^2 = r \times \left(\frac{d^2y}{dx^2}\right)$$

Its order is: 2
Its degree is: 1

viii) $t^3\frac{dy}{dt} + 3ty - 6t^4 = 0$

The given differential equation is:

$$t^3\frac{dy}{dt} + 3ty - 6t^4 = 0$$

Its order is: 1
Its degree is: 1

ix) $\left(\frac{dy}{dt}\right)^3 - 2y\left(\frac{d^2y}{dt^2}\right) = 0$

The given differential equation is:

$$\left(\frac{dy}{dt}\right)^3 - 2y\left(\frac{d^2y}{dt^2}\right) = 0$$

Its order is: 2
Its degree is: 1

Page No. :
Date :

x) $\left(\frac{dy}{dt}\right)^2 = \frac{t^2}{a+t}$

The given differential equation is:

$$\left(\frac{dy}{dt}\right)^2 = \frac{t^2}{a+t}$$

Its order is: 1
Its degree is: 2

---

xi) $\left(\frac{d^2y}{dt^2}\right)^2 = \left(\frac{dy}{dt}\right)^3 + ty$

The given differential equation is:

$$\left(\frac{d^2y}{dt^2}\right)^2 = \left(\frac{dy}{dt}\right)^3 + ty$$

Its order is: 2
Its degree is: 2
