CLASS XII – CHARTER – 9 DIFFERENTIAL EQUATIONS

EXERCISE 9.1

Determine order and degree (when defined) of diff. eqn given in Ex. 1 to 10

Q No 1 $\frac{d^4y}{dx^4} + \sin(y''') = 0$

Sol. The highest order derivative which occurs in given diff eqn.

$\therefore$ Order = 4

Since the differential eqn. contains the term involving tsrigonometsic fn. of derivative $(\sin(y'''))$

$\therefore$ Degree of diff eqn. is Not defined.

Q No 2 $y' + 5y = 0$ ie $\frac{dy}{dx} + 5y = 0$

Sol. Highest orders derivative = dy/dx

$\therefore$ Order of diff. eqn = 1.

Index of $\frac{dy}{dx}$ (higest order derivative) = 1.

$\therefore$ deg. of diff. eqn = 1

Q No 3 $\left(\frac{ds}{dt}\right)^4 + 3s\frac{d^2s}{dt^2} = 0$

Sol. Since highest order derivative which occurs in given diff. eqn. is $\frac{d^2s}{dt^2}$ with index 1.

$\therefore$ deg of diff. eqn = 1 and.

Order of diff eqn = 2.

Q No 4. $\left(\frac{d^2y}{dx^2}\right)^2 + \cos\left(\frac{dy}{dx}\right) = 0$

Sol Highest order derivative $= \frac{d^2y}{dx^2}$.

$\therefore$ Order of diff. eqn = 2

Since given diff. eqn contains term involving trigonometric fn. of derivative $\left(\cos\left(\frac{dy}{dx}\right)\right)$ $\therefore$ Deg. of diff eqn. is Not defined.

QNo 5 $\frac{d^2y}{dx^2} = \cos 3x + \sin 3x$.

Sol. Since the highest order derivative which occurs in the given diff. eqn is $\frac{d^2y}{dx^2}$ with index 1

$\therefore$ Deg. of diff. eqn = 1

and order of diff. eqn is 2.

QNo 6 $(y''')^2 + (y'')^2 + (y')^4 + y^5 = 0$

Sol. Since the highest order derivative which occurs in the given diff eqn is y''' with index 2.

$\therefore$ Order of diff eqn = 3

Deg. of diff eqn = 2.

QNo 7 $y''' + 2y'' + y' = 0$ or $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$

Soln. Since the highest order derivative which occurs in the given diff. eqn is y''' with index 1

$\therefore$ Order of diff eqn = 3

and deg. of diff. eqn = 1.

QNo 8 $y' + y = e^x$

Sol. Since highest order derivative which occurs in the given diff eqn is y' with index 1

$\therefore$ Order of diff. eqn = 1

Deg of diff eqn = 1

QNo 9 $y'' + (y')^2 + 2y = 0$

Sol. Since the highest order derivative which occurs in given diff eqn is y'' with index 1

$\therefore$ Order of Diff eqn = 2

Deg of diff eqn = 1

QNo 10 $y'' + 2y' = \sin y$

Sol: Since the highest order derivative which occurs in given diff eqn is y'' with index 1

$\therefore$ Order of diff eqn = 2

and Deg of diff eqn = 1.

Q No. 11 The degree of diff. eqn

$$\left(\frac{d^3y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^2 + \sin\left(\frac{dy}{dx}\right) + 1 = 0 \text{ is}$$

(A) 3 (B) 2 (C) 1 (D) Not defined.

Sol. Since the differential eqn contains the term involving trigometric fns. of derivative ie $\sin\left(\frac{dy}{dx}\right)$

$\therefore$ deg of diff $= n$ is not defined

$\therefore$ (D) is correct option.

Q No 12. The order of differential eqn

$$2x^2\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0 \text{ is}$$

(A) 2 (B) 1 (C) 0 (D) Not defined.

Sol.: Since the higest order derivative which occurs in given differential eqn is $\frac{d^2y}{dx^2}$

$\therefore$ Order is 2.

$\therefore$ (A) is Correct option.

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