SpeedLabs

MATHS

CBSE 12th

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Differential Equations
Exercise 9.1

1. Determine order and degree (if defined) of differential equation $\frac{d^4y}{dx^4}+\sin\left(y'''\right)=0$

Ans. $\frac{d^4y}{dx^4}+\sin\left(y'''\right)=0$

$\Rightarrow y''''+\sin\left(y'''\right)=0$

The highest order derivative present in the differential equation is y''''. Therefore, its order is four.

The given differential equation is not a polynomial equation in its derivatives. Hence, its degree is not defined.

2. Determine order and degree (if defined) of differential equation $y'+5y=0$

Ans. The given differential equation is:

$y'+5y=0$

The highest order derivative present in the differential equation is y'. Therefore, its order is one. It is a polynomial equation in y'. The highest power raised to y' is 1. Hence, its degree is one.

3. Determine order and degree (if defined) of differential equation $\left(\frac{ds}{dt}\right)^4+3s\frac{d^2s}{dt^2}=0$

Ans. $\left(\frac{ds}{dt}\right)^4+3s\frac{d^2s}{dt^2}=0$

The highest order derivative present in the given differential equation is $\frac{d^2s}{dt^2}$. Therefore, its order is two. It is a polynomial equation in $\frac{d^2s}{dt^2}$ and $\frac{ds}{dt}$. The power raised to $\frac{d^2s}{dt^2}$ is 1. Hence, its degree is one.

4. Determine order and degree (if defined) of differential equation $\left(\frac{d^2y}{dx}\right)^2+\cos\left(\frac{dy}{dx}\right)=0$

Ans. $\left(\frac{d^2y}{dx}\right)^2+\cos\left(\frac{dy}{dx}\right)=0$

The highest order derivative present in the given differential equation is $\frac{d^2y}{dx^2}$. Therefore, its order is 2.

The given differential equation is not a polynomial equation in its derivatives. Hence, its degree is not defined.

5. Determine order and degree (if defined) of differential equation $\frac{d^2y}{dx^2} = \cos 3x + \sin 3x$

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

$\Rightarrow \frac{d^2y}{dx^2} - \cos 3x - \sin 3x = 0$

The highest order derivative present in the differential equation is $\frac{d^2y}{dx^2}$. Therefore, its order is two.

It is a polynomial equation in $\frac{d^2y}{dx^2}$ and the power raised to $\frac{d^2y}{dx^2}$ is 1.

Hence, its degree is one.

6. Determine order and degree (if defined) of differential equation

$(y'''')^2 + (y'')^3 + (y')^4 + y^5 = 0$

Ans. $(y'''')^2 + (y'')^3 + (y')^4 + y^5 = 0$

The highest order derivative present in the differential equation is y'''. Therefore, its order is three.

The given differential equation is a polynomial equation in $y''', y'', and y'$..

The highest power raised to y''' is 2. Hence, its degree is 2.

7. Determine order and degree (if defined) of differential equation $y''' + 2y'' + y' = 0$

Ans. The highest order derivative present in the differential equation is y'''. Therefore, its order is three.

It is a polynomial equation in $y''', y'' and y'$. The highest power raised to y''' is 1. Hence, its degree is 1.

8. Determine order and degree (if defined) of differential equation $y' + y = e^x$

Ans. $y' + y = e^x$

$\Rightarrow y' + y - e^x = 0$

The highest order derivative present in the differential equation is y'. Therefore, its order is one.

The given differential equation is y' a polynomial equation in and the highest power raised to y' is one.

Hence, its degree is one.

9. Determine order and degree (if defined) of differential equation $y'' + (y')^2 + 2y = 0$

Ans. $y'' + (y')^2 + 2y = 0$

The highest order derivative present in the differential equation is y''. Therefore, its order is two.

The given differential equation is a polynomial equation in y'' and y' and the highest power raised to y'' is one. Hence, its degree is one.

10. Determine order and degree (if defined) of differential equation $y''+2y'+\sin y=0$

Ans. $y''+2y'+\sin y=0$

The highest order derivative present in the differential equation is y''. Therefore, its order is two.

This is a polynomial equation in y'' and y' and the highest power raised to y'' is one. Hence, its degree is one.

11. The degree of the differential equation

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

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

The given differential equation is not a polynomial equation in its derivatives. Therefore, its degree is not defined. Hence, the correct answer is D.

12. The order of the differential equation

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

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

The highest order derivative present in the given differential equation is $\frac{d^2y}{dx^2}$. Therefore, its order is two.

Hence, the correct answer is A.