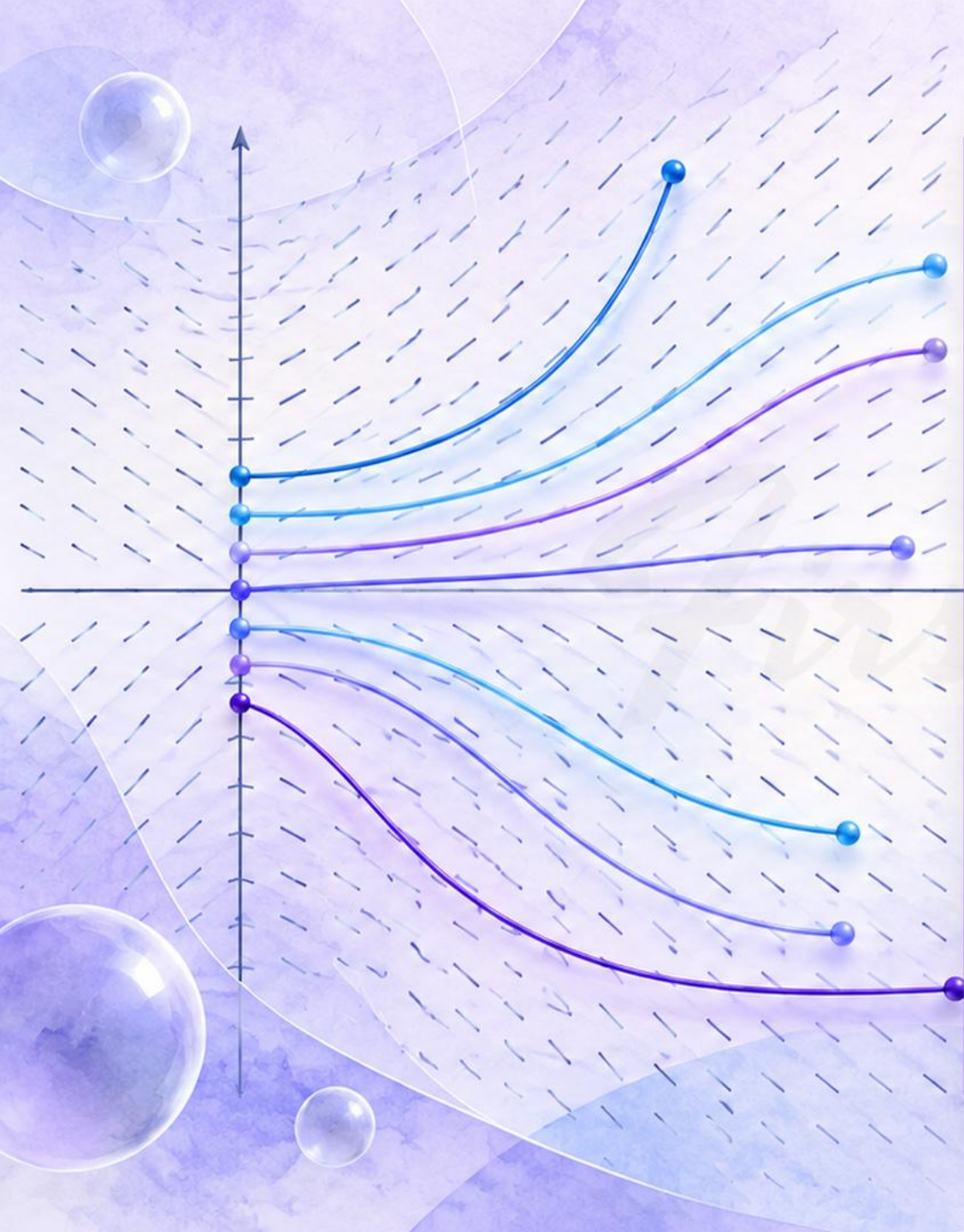




MATHEMATICS • CLASS 12

9

CHAPTER

Differential Equations

NCERT SOLUTIONS

DIFFERENTIAL EQUATIONS – EXERCISE 9.1 Q1

Q. Determine order and degree (if defined) of the differential equation :

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

Answer:

The highest order derivative present in the differential equation is $\frac{d^4 y}{dx^4}$, so its order is four.

The given differential equation is not a polynomial equation in its derivatives because the term $\sin(y''')$ involves y''' (which is a derivative), and hence the equation is not polynomial in its derivatives. Therefore, the degree is not defined.

Hence, Order 4; degree not defined.

DIFFERENTIAL EQUATIONS – EXERCISE 9.1 Q2

Q. Determine order and degree (if defined) of the differential equation :

$$y' + 5y = 0.$$

Answer:

The highest order derivative present in the given differential equation is y' , so the order is 1.

The given equation is a polynomial equation in y' and the highest power of y' is 1, so the degree is 1.

Hence, Order 1; degree 1.

DIFFERENTIAL EQUATIONS — EXERCISE 9.1 Q3

Q. Determine the order and degree (if defined) of the differential equation :

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

Answer:

The highest order derivative present in the given differential equation is $\frac{d^2s}{dt^2}$, so its order is 2.

The equation is a polynomial in the derivatives $\frac{ds}{dt}$ and $\frac{d^2s}{dt^2}$, and the highest power of the highest order derivative $\frac{d^2s}{dt^2}$ is 1.

Therefore, the degree of the differential equation is 1.

Hence, Order 2; degree 1.

DIFFERENTIAL EQUATIONS — EXERCISE 9.1 Q4

Q. Determine the order and degree (if defined) of the differential equation :

$$(y'')^2 + \cos(y') = 0.$$

Answer:

The order of a differential equation is the order of the highest order derivative present in the equation.

In the given equation $(y'')^2 + \cos(y') = 0$, the highest order derivative present is y'' .

Hence, the order of the given differential equation is 2.

The degree is defined only if the equation is a polynomial equation in its derivatives. This means that each derivative should appear with a non-negative integer power and should not be inside any non-polynomial function (such as $\sin$, $\cos$, $\exp$, $\log$, etc.).

In the given equation $(y'')^2 + \cos(y') = 0$, the term $\cos(y')$ contains the first derivative y' inside a trigonometric function. Therefore, the equation is not a polynomial in its derivatives.

Since the equation is not polynomial in its derivatives, the degree is not defined.

Hence, Order 2; degree not defined.

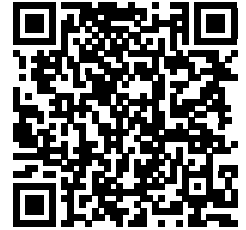


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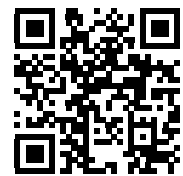


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