Definition.

An equation involving independent variable *x*, dependent variable *y* and the differential coefficients $\frac{dy}{dx}, \frac{d^2y}{dx^2}, \ldots\ldots$ is called differential equation.

Examples:

(i) $\frac{dy}{dx} = 1 + x + y$

(ii) $\frac{dy}{dx} + xy = \cot x$

(iii) $\left(\frac{d^4y}{dx^4}\right)^3 - 4\frac{dy}{dx} + 4y = 5\cos 3x$

(iv) $x^2\frac{d^2y}{dx^2} + \sqrt{1 + \left(\frac{dy}{dx}\right)^2} = 0$

Order of a differential equation: The order of a differential equation is the order of the highest derivative occurring in the differential equation. For example, the order of above differential equations are 1,1,4 and 2 respectively.

Note: The order of a differential equation is a positive integer. To determine the order of a differential equation, it is not needed to make the equation free from radicals.

(2) **Degree of a differential equation:** The degree of a differential equation is the degree of the highest order derivative, when differential coefficients are made free from radicals and fractions. In other words.

the degree of a differential equation is the power of the highest order derivative occurring in differential equation when it is written as a polynomial in differential coefficients.

Note:The definition of degree does not require variables *x*, *y*, *t* etc. to be free from radicals and fractions. The degree of above differential equations are 1, 1, 3 and 2 respectively.