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Order of a D.E.: The order of a differential equation is the order of the highest ordered derivative occurring in the diff" eg".

a D.E: The degree of a differential equation is the degree of the highest ordered derivative present in the diff" eg" when it is made free from radical sign and fractional power.

order = 1

Degree = 1

 $\frac{dy}{dx^2} + y = 0$ 

Degree = 1

































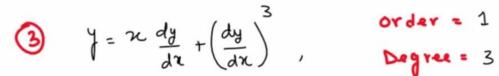








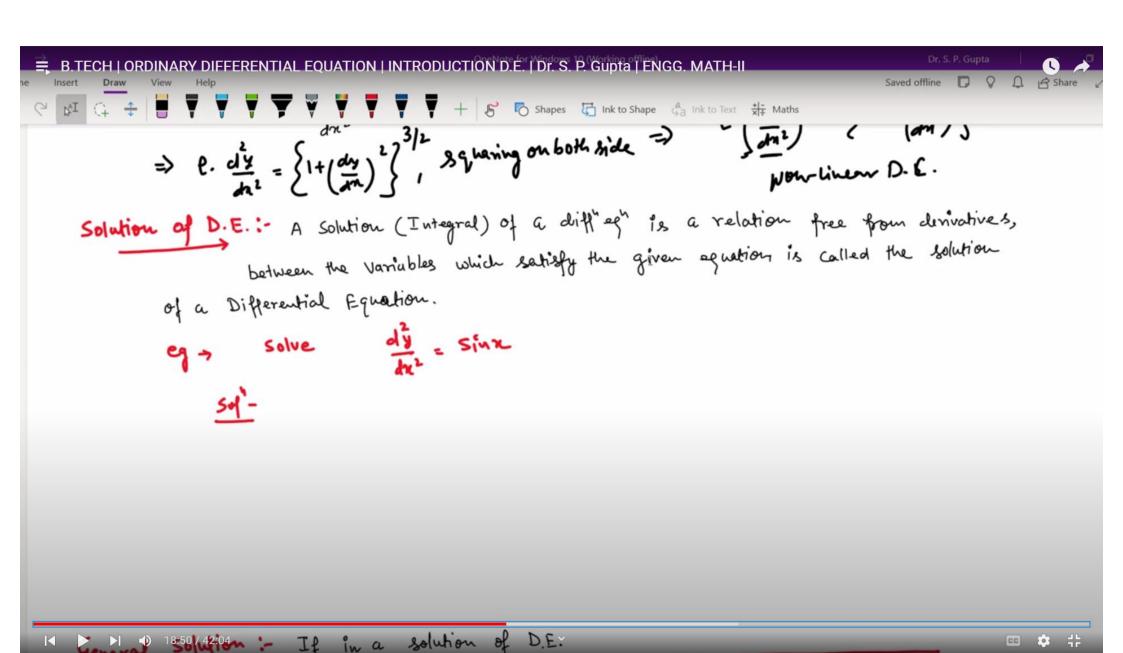


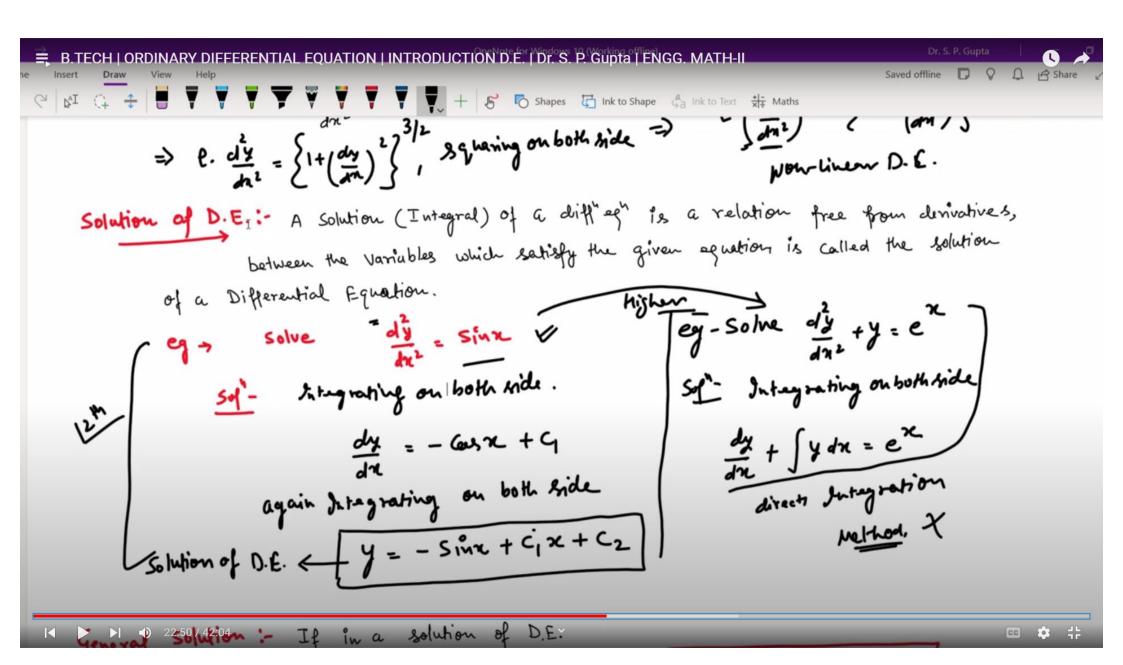


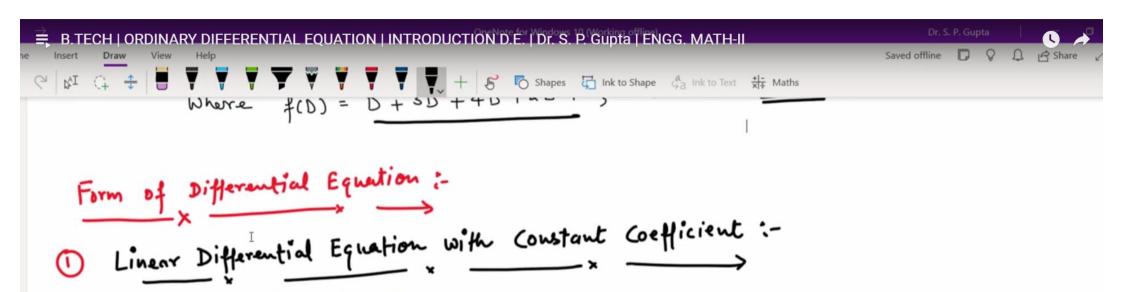
Non-linear D.E.

$$\frac{d^2y}{dx^2} + \sqrt{1 + \left(\frac{dy}{dx}\right)^3} = 0 , \quad \text{order = 2}$$
Degree = 2

6 
$$P = \frac{\left\{1 + \left(\frac{dy}{dn}\right)^2\right\}^{3}}{\frac{d^2y}{dn^2}}$$



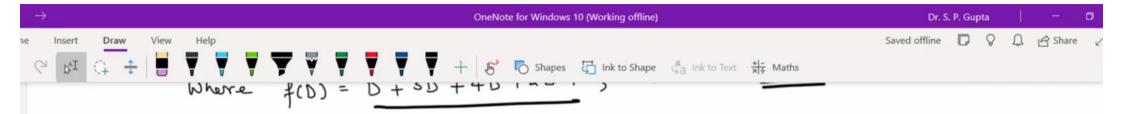




An equation is of the form
$$a_0 \frac{dy}{dx^n} + a_1 \frac{d^ny}{dx^{n-1}} + a_2 \frac{d^ny}{dx^{n-2}} + \cdots + a_ny = 0$$

Where  $a_0, a_1, a_2, \dots$  an all are constant and Q is a function of or only. is Called L.D.E. with Constant Coefficient.

(Euler-Cauchy Equation with Constant Coefficient :-



## Form of Differential Equation :-

1) Linear Differential Equation with Constant Coefficient:

An equation is of the form

$$a_0 \frac{dy}{dx^n} + a_1 \frac{d^{n-1}y}{dx^{n-1}} + a_2 \frac{d^{n-2}y}{dx^{n-2}} + \cdots + a_n y = Q$$

Where  $a_0, a_1, a_2, \dots$  an all are constant and Q is a function of or only. is Called L.D.E. with Constant Coefficient.

(3) Homogeneous Linear Differential Equation with Constant Coefficient :
( Euler-Cauchy Equation)



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Homogeneous Linear Differential Equation with Constant Coefficient :-( Euler-Cauchy Equation)

An equation is of the form

$$a_0 x^n \frac{dy}{dx^n} + a_1 x^{n-1} \frac{d^n y}{dx^{n-1}} + a_2 x^{n-2} \frac{d^n y}{dx^{n-2}} + \cdots + a_n y = 0$$

a, a, a, --- an all are Constant and Q is a function of x-only is Called Homogeneous L.D.E. with Constant Coefficient.

Linear Differential Equation of Second Order with Variable Coefficient: A diff eg" is of the form dy + Pdy + Qy = R

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 $a_0 x^n d \frac{dy}{dx^n} + a_1 x^{n-1} d \frac{d^{n-1}y}{dx^{n-1}} + a_2 x^{n-2} d \frac{dy}{dx^{n-2}} + \cdots + a_n y = 0$ 

a, a, a, --- an all are Constant and Q is a function of x-only is Called Homogeneous L.D.E. with Constant Coefficient.

Linear Differential Equation of Second Order with Variable Coefficient:

A diff eq" is of the form dy + Pdy + Qy = R

where P, Q, R are the function of x-only is Called L.D.E. of Second order with variable Coefficient.

Consider the D.E. f(D) y = Q, then

