

Mo	Tu	We	Th	Fr	Sa	Su
30	31	.	.	.	.	01
02	03	04	05	06	07	08
09	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

(अवकलन)

Day (036-330)

February

05

WEDNESDAY

Differentiation

किसी फलन $f(x)$ का अवकलन ज्ञात करने की गणितीय क्रिया को अवकलन कहा जाता है।

Rule - 1

$$y = x^n \quad \text{now, } \frac{dx^n}{dx} = nx^{n-1}$$

here,

$$\boxed{d \log x = \frac{1}{x}}$$

Q:- Find the differential Coefficient of $y = 5x^2$ with respect to x .

Solution:-

$$y = 5x^2$$

$$\frac{dy}{dx} = \frac{d5x^2}{dx}$$

$$= 5 \left(\frac{dx^2}{dx} \right)$$

$$= 5x^2 \left(\frac{dx^{2-1}}{dx} \right)$$

$$= 10x$$

Q:- Find the differential Co-efficient of $y = 7x^3$ with respect to x .

Solution:-

$$y = 7x^3$$

$$\frac{dy}{dx} = \frac{d7x^3}{dx}$$

$$p = 7 \left(\frac{dx^3}{dx} \right)$$

$$= 7 \times 3 \left(\frac{dx^{3-1}}{dx} \right)$$

$$= 21x^2$$

Q: Find the differential co-efficient of $y = 4x^3 + 2x^2 + 4x$ with respect of x .

Solution

$$y = 4x^3 + 2x^2 + 4x$$

$$\frac{dy}{dx} = \frac{d 4x^3}{dx} + \frac{d 2x^2}{dx} + \frac{d 4x}{dx}$$

$$= 4 \left(\frac{d x^3}{dx} \right) + 2 \left(\frac{d x^2}{dx} \right) + 4 \left(\frac{d x}{dx} \right)$$

$$= 4 \times 3 \left(\frac{d x^{3-1}}{dx} \right) + 2 \times 2 \left(\frac{d x^{2-1}}{dx} \right) + 4$$

$$= 12x^2 + 4x + 4$$

$$y = 9x^4 + 3x^3 + 4x^2 + 5x + 10$$

$$\frac{dy}{dx} = 9 \left(\frac{dx^4}{dx} \right) + 3 \left(\frac{dx^3}{dx} \right) + 4 \left(\frac{dx^2}{dx} \right) + 5 \left(\frac{dx}{dx} \right) + 0$$

$$= 9x4 \left(\frac{dx^{4-1}}{dx} \right) + 3x3 \left(\frac{dx^{3-1}}{dx} \right) + 4x2 \left(\frac{dx^{2-1}}{dx} \right) + 5$$

$$= 36x^3 + 9x^2 + 8x + 5$$

Q:- $y = 3x^3 + 2x^2 + h$

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

$$= 3 \times 3 \left(\frac{dx^{3-1}}{dx} \right) + 2 \times 2 \left(\frac{dx^{2-1}}{dx} \right)$$

$$= 9x^2 + 4x$$

Case - IV

Q:- $y = 3x^2 + 4x + \log x + 20$

$$\frac{dy}{dx} = 3 \left(\frac{dx^2}{dx} \right) + 4 \left(\frac{dx}{dx} \right) + \left(\frac{d \log x}{dx} \right) + 0$$

$$= 3 \times 2 \left(\frac{dx^{2-1}}{dx} \right) + 4 + \frac{1}{x}$$

$$= 6x + 4 + \frac{1}{x}$$

nday 09

Case - v Q:- $y = 9x^4 + 4x^3 + \log x + e^x$

$$\frac{dy}{dx} = 9 \left(\frac{dx^4}{dx} \right) + 4 \left(\frac{dx^3}{dx} \right) + \left(\frac{d \log x}{dx} \right) + \left(\frac{de^x}{dx} \right)$$

$$= 9x4 \left(\frac{dx^{4-1}}{dx} \right) + 4x3 \left(\frac{dx^{3-1}}{dx} \right) + \frac{1}{x} + e^x$$

$$= 36x^3 + 12x^2 + \frac{1}{x} + e^x$$

$$Q: y = \cos x + 2 \sec x$$

$$\frac{dy}{dx} = \frac{d \cos x}{dx} + 2 \left(\frac{d \sec x}{dx} \right)$$

$$= -\sin x + 2 \sec x \cdot \tan x$$

Formula

$$\therefore \sec x = \frac{1}{\cos x}$$

$$\tan x = \frac{\sin x}{\cos x}$$

$$= -\sin x + 2 \cdot \frac{1}{\cos x} \cdot \sin x$$

$$= \sin x \left(\frac{2}{\cos^2 x} - 1 \right)$$

$$= \frac{\sin x}{\cos^2 x} (2 - \cos^2 x)$$

$$= \frac{\sin x}{\cos x \cdot \cos x} (1 + 1 - \cos^2 x)$$

$$= \tan x \sec x (1 + \sin^2 x)$$