

2.5 The Chain Rule

• قانون مشتقة القوس :

$$\text{If } y = [f(x)]^n \rightarrow y' = n [f(x)]^{n-1} \cdot f'(x)$$

Example 1 : If $y = (2x^2 - 4x + 1)^{60}$, find $D_x y$

Solution

$$D_x y = 60 (2x^2 - 4x + 1)^{59} (4x - 4)$$

Example 2 : If $y = \frac{1}{(2x^5 - 7)^3}$, find $\frac{dy}{dx}$

Solution

$$y = \frac{1}{(2x^5 - 7)^3} = 1 \cdot (2x^5 - 7)^{-3} = (2x^5 - 7)^{-3}$$

$$\frac{dy}{dx} = -3(2x^5 - 7)^{-4} (10x^4) = -30x^4 (2x^5 - 7)^{-4} = \frac{-30x^4}{(2x^5 - 7)^4}$$

Example 4 : If $y = \sin 2x$, find $\frac{dy}{dx}$

Solution

$$\frac{dy}{dx} = 2 \cos 2x$$

Example 7 : Find $\frac{d}{dx} \frac{1}{(2x-1)^3}$

Solution

$$\frac{d}{dx} (2x - 1)^{-3} = -3 (2x - 1)^{-4} (2) = -6(2x - 1)^{-4} = \frac{-6}{(2x - 1)^4}$$

Example 9 : Find $D_x \sin^3(4x)$

Solution

$$D_x [\sin(4x)]^3 = 3 [\sin(4x)]^2 [4 \cos(4x)] = 12 \cos(4x) \sin^2(4x)$$

Example 10 : Find $D_x \sin[\cos(x^2)]$

Solution

$$D_x \sin[\cos(x^2)] = -2x \sin(x^2) \cos[\cos(x^2)]$$