2.3   Rules for Finding Derivatives

- قانون الاشتقاق العام :

$$If \ f(x) = kx^n \rightarrow \ f'(x) = nkx^{n-1}$$

- قانون اشتقاق الرقم الثابت :

$$If \ f(x) = k \rightarrow \ f'(x) = 0$$

- قانون مشتقة جمع أو طرح دالتين :

$$If \ y = f(x) \pm g(x) \rightarrow \ y' = f'(x) \pm g'(x)$$

- قانون مشتقة ضرب دالتين :

$$If \ y = f(x) \cdot g(x) \rightarrow \ y' = f'(x) \cdot g(x) + f(x) \cdot g'(x)$$

- قانون مشتقة قسمة دالتين :

$$If \ y = \frac{f(x)}{g(x)} \rightarrow \ y' = \frac{\left[f'(x) \cdot g(x)\right] - \left[f(x) \cdot g'(x)\right]}{[g(x)]^2}$$

<u>Example 1 :</u>   Find the derivatives of (a) $5x^2 + 7x - 6$ and (b)
$4x^6 - 3x^5 - 10x^2 + 5x + 16$

Solution

(a) derivatives of $5x^2 + 7x - 6 = 10x + 7x^0 - 0 = \mathbf{10x - 7}$

(b) derivatives of $4x^6 - 3x^5 - 10x^2 + 5x + 16 = \mathbf{24x^5 - 15x^4 - 20x + 5}$

Example 3 : Find the derivative of $(3x^2 - 5)(2x^4 - x)$

Solution

$$(3x^2 - 5)(2x^4 - x) = 6x^6 - 3x^3 - 10x^4 - 5x$$

Thus:

the derivative of $6x^6 - 3x^3 - 10x^4 - 5x = \mathbf{36x^5 - 9x^2 - 40x^3 - 5}$

Example 4 : Find $\dfrac{d}{dx}\dfrac{(3x-5)}{(x^2+7)}$

Solution

$$\frac{d}{dx}\frac{(3x - 5)}{(x^2 + 7)} = \frac{[(3)(x^2 + 7)] - [(3x - 5)(2x)]}{(x^2 + 7)^2}$$

$$= \frac{[3x^2 + 21] - [6x^2 - 10x]}{(x^2 + 7)^2} = \frac{3x^2 + 21 - 6x^2 + 10x}{(x^2 + 7)^2}$$

$$= \frac{\mathbf{-3x^2 + 10x + 21}}{(x^2 + 7)^2}$$

Example 5: Find $D_x y$ if $y = \dfrac{2}{x^4+1} + \dfrac{3}{x}$

Solution

$$D_x y = \frac{[(0)(x^4 + 1)] - [(2)(4x^3)]}{(x^4 + 1)^2} + \frac{[(0)(x)] - [(3)(1)]}{x^2}$$

$$= \frac{\mathbf{-8x^3}}{(x^4 + 1)^2} + \frac{\mathbf{-3}}{x^2}$$

2