<u>Diffrentiation = अवकलन</u>

<u>07. Quotient rule</u>

$$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{d}{dx}u - u\frac{d}{dx}v}{v^2}$$

$$y = \frac{x^2 - 1}{x^2 + 1}$$

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

$$= \frac{(x^2 + 1)\left[\frac{d}{dx}(x^2) - \frac{d}{dx}(1)\right] - (x^2 - 1)\left[\frac{d}{dx}(x^2) + \frac{d}{dx}(1)\right]}{(x^2 + 1)^2}$$

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

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

$$\frac{(x^2 + 1)[2x] - (x^2 - 1)[2x]}{(x^2 + 1)^2}$$

$$\frac{4x}{(x^2 + 1)^2} \; Ans$$

$$y = \frac{2x}{4x + 3}$$

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

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

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

$$= \frac{8x + 6 - 8x}{(4x + 3)^2} = \frac{6}{(4x + 3)^2} \; Ans$$

$$y = \frac{2x - 3}{2x + 1}$$

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

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

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

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

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

$$= \frac{(1)[2] - (-3)[2] = 2 + 6}{(2x + 1)^2} = \frac{8}{(2x + 1)^2} \; Ans.$$