## Tutorial Examples :-

Ex.1:

(a) $y = (3 - x^2)(x^3 - x + 1) \Rightarrow y' = (3 - x^2) \cdot \frac{d}{dx}(x^3 - x + 1) + (x^3 - x + 1) \cdot \frac{d}{dx}(3 - x^2)$
$= (3 - x^2)(3x^2 - 1) + (x^3 - x + 1)(-2x) = -5x^4 + 12x^2 - 2x - 3$

(b) $y = -x^5 + 4x^3 - x^2 - 3x + 3 \Rightarrow y' = -5x^4 + 12x^2 - 2x - 3$

Ex.2:

$y = \left(x + \frac{1}{x}\right)\left(x - \frac{1}{x} + 1\right)$

(a) $y' = (x + x^{-1}) \cdot (1 + x^{-2}) + (x - x^{-1} + 1)(1 - x^{-2}) = 2x + 1 - \frac{1}{x^2} + \frac{2}{x^3}$

(b) $y = x^2 + x + \frac{1}{x} - \frac{1}{x^2} \Rightarrow y' = 2x + 1 - \frac{1}{x^2} + \frac{2}{x^3}$

Ex.3:

$s = \tan t - t \Rightarrow \frac{ds}{dt} = \frac{d}{dt}(\tan t) - 1 = \sec^2 t - 1 = \tan^2 t$

$s = t^2 - \sec t + 1 \Rightarrow \frac{ds}{dt} = 2t - \frac{d}{dt}(\sec t) = 2t - \sec t \tan t$

Ex.4

$x^2(x - y)^2 = x^2 - y^2$:

Step 1: $x^2\left[2(x - y)\left(1 - \frac{dy}{dx}\right)\right] + (x - y)^2(2x) = 2x - 2y\frac{dy}{dx}$

Step 2: $-2x^2(x - y)\frac{dy}{dx} + 2y\frac{dy}{dx} = 2x - 2x^2(x - y) - 2x(x - y)^2$

Step 3: $\frac{dy}{dx}[-2x^2(x - y) + 2y] = 2x[1 - x(x - y) - (x - y)^2]$

Step 4: $\frac{dy}{dx} = \frac{2x[1 - x(x - y) - (x - y)^2]}{-2x^2(x - y) + 2y} = \frac{x[1 - x(x - y) - (x - y)^2]}{y - x^2(x - y)} = \frac{x(1 - x^2 + xy - x^2 + 2xy - y^2)}{x^2y - x^3 + y}$
$= \frac{x - 2x^3 + 3x^2y - xy^2}{x^2y - x^3 + y}$

Ex.5:

$x + \sin y = xy \Rightarrow 1 + (\cos y)\frac{dy}{dx} = y + x\frac{dy}{dx} \Rightarrow (\cos y - x)\frac{dy}{dx} = y - 1 \Rightarrow \frac{dy}{dx} = \frac{y - 1}{\cos y - x}$

Ex.6: Two cars leave a depot . Car A traveling east at 40 mph and car B traveling north at 30 mph . How fast is the distance between the cars changing after 6 minutes ?