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Assignment Mathematics 1
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Mid Term Summer 2020 B-Tech

Q1 Find the First
a) derivative of
$y = x^2 + x + 8.$

Ans $y = x^2 + x + 8$

taking derivative w.r.t "x"

$$\frac{dy}{dx} = \frac{d}{dx}\left(x^2 + x + 8\right)$$

$$= 2x + 1$$

$$\boxed{\frac{dy}{dx} = 2x + 1}.$$

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b) Find the First derivative applying the product rule of
$y = (3-x^2)(x^3-x+1)$

Ans $y = (3-x^2)(x^3-x+1)$

taking derivative

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

by product rule:

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

$$= (3-x^2)(3x^2-1)+(x^3-x+1)(-2x)$$

$$= (9x^2-3-3x^4-x^2)+(-2x^4+2x^2-2x)$$

$$\Rightarrow -5x^4+10x^2-2x-3 \quad \text{Ans.}$$

Q3
a) Write the equation of straight line passing through (-1, 1) with slope, - 1.

Ans Slope $= m = -1$

$= (x, y) = (-1, 1)$

$=$ y- intercept $= c = 1$

$\Rightarrow$ As $y = mx + c$

$y = (-1)x + 1$

$y = -x + 1$ Ans.

b) A particale start at A (-2.3) and its co ordinates change by increment $\Delta x = 5$, $\Delta y = -6$, find its new position.

Ans $\Delta x = 5$

$\Delta y = 6$

A (-2, 3)

$\rightarrow$ Find its new position?

Sol::

As $\Delta x = x_2 - x_1$

$\Delta y = y_2 - y_1$

So $x_1 = -2$

$y_1 = 3$

$\Rightarrow \Delta x = x_2 - x_1$

$\Rightarrow 5 = x_2 - (-2)$

$\Rightarrow 5 = x_2 + 2$

$\Rightarrow 5 - 2 = x_2$

$\Rightarrow x_2 = 3$

and

$\Rightarrow \Delta y = y_2 - y_1$

$\Rightarrow 6 = y_2 - 3$

$\Rightarrow y_2 = 6 + 3 = 9$

So

the new position is

A (3, 9) ~~Ans~~

Q3 Find the equation of Tangent and normal to the curve $x^2 - xy + y^2 = 7$ at the point $(-1, 2)$.

Ans Solution:

$$x^2 - xy + y^2 = 7$$

First Differinete it

$$\Rightarrow \frac{d}{dx} x^2 - \frac{d}{dx} xy + \frac{d}{dx} y^2 = \frac{d}{dx} 7$$

$$\Rightarrow 2x - \left\{ x \frac{dy}{dx} + y(1) \right\} + 2y \frac{dy}{dx} = 0$$

$$\Rightarrow 2x - x\frac{dy}{dx} - y + 2y\frac{dy}{dx} = 0$$

$$2y\frac{dy}{dx} - x\frac{dy}{dx} = y - 2x$$

$$\Rightarrow \frac{dy}{dx}(2y - x) = y - 2x$$

$$\frac{dy}{dx} = \frac{y - 2x}{2y - x}$$

at point $P(-1, 2)$

$$\Rightarrow m = \frac{dy}{dx} = \frac{2 - 2(-1)}{2(2) - (-1)}$$

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$\Rightarrow \frac{2+2}{4+1} = m = 4/5$

Now equation of tangent line is

$y - y_1 = m(x - x_1)$

$y - 2 = 4/5\,(x+1)$

$\Rightarrow 5y - 10 = 4x + 4$

$= 4x - 5y + 4 + 10 = 0$

$= \boxed{4x - 5y + 14 = 0}$

So its slop of tangent line is $m = 4/5$

So slop of normal line is $m_1 = -5/4$.

equation of normal line is

$y - y_1 = m_1(x - x_1)$

$\Rightarrow y - y_2 \quad \frac{-5}{4}(x+1)$

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$$\Rightarrow \quad y - 2 = \frac{-5}{4}(x+1)$$

$$4y - 8 = -5x - 5$$

$$5x + 4y - 8 + 5 = 0$$

$$\boxed{5x + 4y - 3 = 0} \text{ Ans.}$$