Question 1 (a):—

Identify $\lim_{x \to 1} \frac{x^2+x-2}{x^2-x}$

Sol:-

$$\lim_{x \to 1} \left(\frac{x^2+x-2}{x^2-x}\right)$$

$$\lim_{x \to 1} \frac{x^2+2x-x-2}{x(x-1)}$$

$$\lim_{x \to 1} \left(\frac{x(x+2)-1(x+2)}{x(x-1)}\right)$$

$$\lim_{x \to 1} \frac{(x+2)(x-1)}{x(x-1)}$$

$$\lim_{x \to 1} \frac{x+2}{x}$$

$$\lim_{x \to} \frac{1+2}{1}$$

$$\boxed{= 3}$$ solution

Question 1(b) :-

Find the first odes derivaitives of the function

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

Sol :-

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

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

$$= (3-x^2)(3x^2-1) + x^3-x+1)(0-2x)$$

$$9x^2 - 3 - 3x^4 + x^2 - 2x^4 - 2x$$

$$= -5x^4 + 12x^2 - 2x - 3$$

Question 2:-

$s = t^3 - t^2 + 9t$

a) $a = ?$ when $v = 0$

b) $v = ?$ when $a = 0$

$v = \frac{ds}{dt} = 3t^2 - 2t + 9$

$a) = \frac{dv}{dt} = 6t - 2$

when $v = 0$ then $3t^2 - 2t + 9 = 0$

$3t^2 - 2t + 9 = 0$

$t = 0.333 \mp 1.699i$

$a = 6t - 2$ putting value of t

$a = 6(0.33 - 1.69i) - 2$

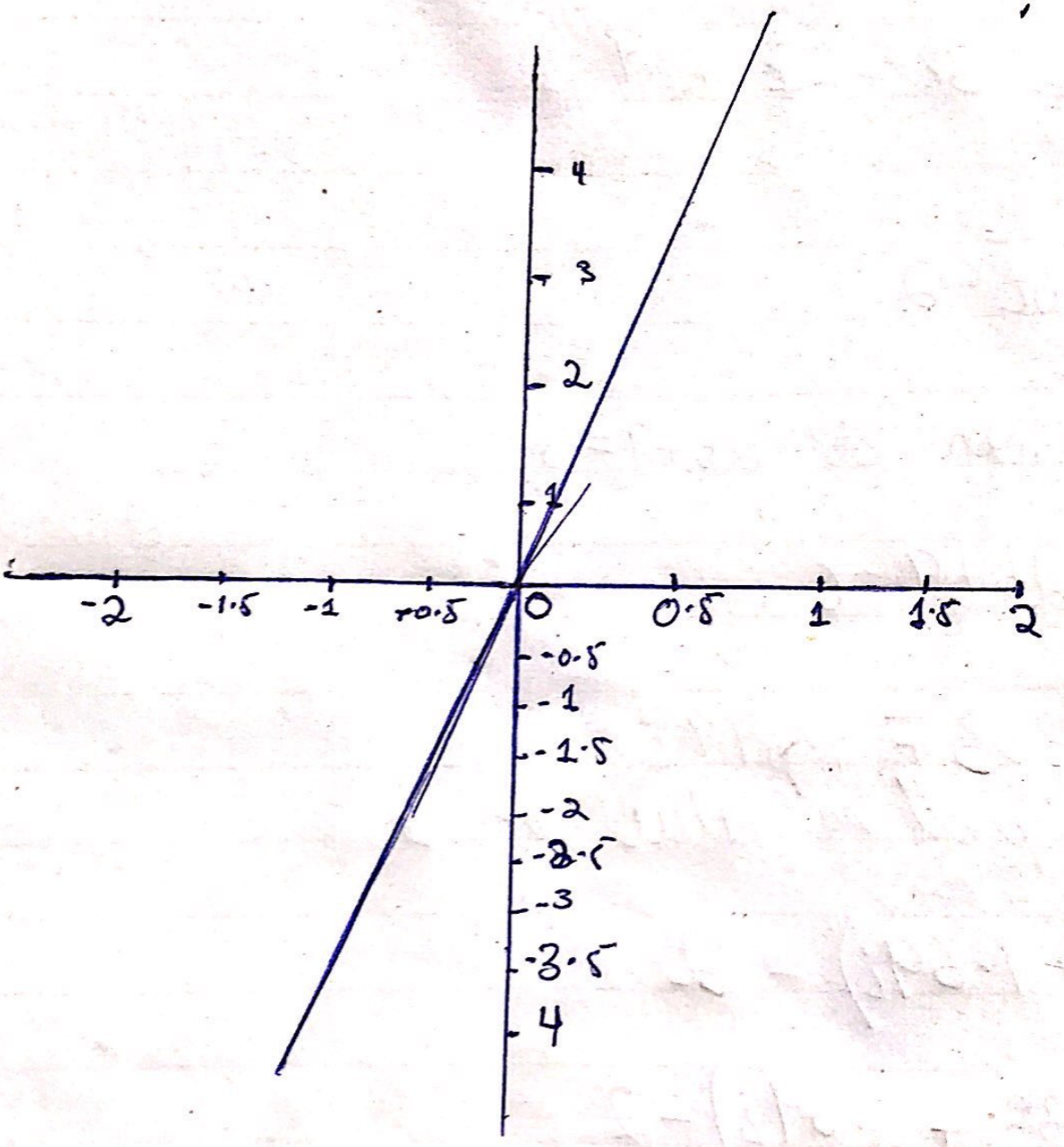
$a = 6(0.33 + 1.69i) - 2$

For $v = 3t^2 - 2t + 9$

putting value of t

$v = 3(0.33 - 1.69i)^2 - 2(0.33 - 1.69i) + 9$

$v = 3(0.33 + 1.69i)^2 - 2(0.33 + 1.69i) + 9$



★ $S = t^3 - t^2 + 9t$

Root (0,0)

Domain $t \in R$

Range $S \in R$

vertical intercept (0,0)

Question 3 :-

Find the equation of tangent and normal to the curve at the given point where

$x^2 - xy + y^2 = 7 \quad (2, 3)$

Sol :-

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

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

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

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

given point $(2, 3)$

$$\text{So, } \left.\frac{dy}{dx}\right|_{(2,3)} = \frac{2(2) + 3}{2(3) - 2} = \frac{-1}{-8}$$

$$\boxed{= \frac{1}{8}}$$

The eq of tangent

$$y - y_1 = \frac{dy}{dx}(x - x_1)$$

$$y - 3 = \frac{1}{8}(x - 2)$$

$$8y - 24 = x - 2$$

$$x - 8y - 2 + 24 = 0$$

$$\boxed{x - 8y + 22 = 0}$$

Eq of normal

$$y - y = -\frac{1}{dy/dx}(x - x_1)$$

$$y - 3 = \frac{1}{1/8}(x - 2)$$

$$y - 3 = -8(x - 2)$$

$$y - 3 = -8x + 16$$

$$8x + y - 3 - 16 = 0$$

$$\boxed{8x + y - 19 = 0}$$