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DEPARTMENT: COMPUTER ENGINEERING

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COURSE: MAT 104

### ASSIGNMENT

1) Determine the stationary point, coordinate of the stationary point and nature of the stationary point of the curve  $y = t^3 - t^2/2 - 2t + 4$

i) At stationary point,  $\frac{dy}{dt} = 0$

$$\frac{dy}{dt} = 3t^2 - t - 2 = 0$$

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

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

$$3t(t-1) + 2(t-1) = 0$$

$$(t-1)(3t+2) = 0$$

$$t-1 = 0 \text{ or } 3t+2 = 0$$

$$t = 1 \text{ or } 3t = -2$$

$$t = 1 \text{ or } t = -\frac{2}{3}$$

ii) For coordinates of the stationary point.

At  $t = 1$

$$y = (1)^3 - \frac{(1)^2}{2} - 2(1) + 4$$

$$y = 1 - \frac{1}{2} - 2 + 4$$

$$y = \frac{5}{2}$$

At  $t = -\frac{2}{3}$

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

$$y = \frac{8}{27} - \frac{2}{9} + \frac{1}{3} + 4$$

$$y = \frac{130}{27}$$

iii) For the nature of the stationary point,  $(1, \frac{5}{2})$  and  $(-\frac{2}{3}, \frac{130}{27})$  are the coordinates of the stationary point.

ii) For the nature of the stationary point,

$$\frac{d^2y}{dx^2} = 6t - 1$$

$$\text{When } t = -\frac{2}{3}$$

$$6(-\frac{2}{3}) - 1 = -5$$

At  $t = -\frac{2}{3}$ , we have a maximum point.

$$\text{When } t = 1$$

$$6(1) - 1 = 5$$

At  $t = 1$ , we have a minimum point.

2) If  $2y^2 - 5x^4 - 2 - 7y^3 = 0$ , Find  $\frac{dy}{dx}$

$$2y^2 - 5x^4 - 7y^3 = 2$$

$$\frac{dy}{dx} = \frac{d}{dx}(2y^2) - \frac{d}{dx}(5x^4) - \frac{d}{dx}(-7y^3)$$

$$\frac{dy}{dx} = \frac{d}{dx}(2y^2) - \frac{d}{dx}(5x^4) - \frac{d}{dx}(7y^3) = \frac{d}{dx}(2)$$

$$= 4y \frac{dy}{dx} - 20x^3 - 21y^2 \frac{dy}{dx} = 0$$

$$4y \frac{dy}{dx} - 21y^2 \frac{dy}{dx} = 20x^3$$

$$\frac{dy}{dx} (4y - 21y^2) = 20x^3$$

$$\frac{dy}{dx} = \frac{20x^3}{(4y - 21y^2)}$$

$$\frac{dy}{dx} = \frac{20x^3}{4y - 21y^2} = \frac{20x^3}{y(4 - 21y)}$$

3) Find  $\frac{dy}{dx}$  if  $4x^2 + 2xy^3 - 5y^2 = 0$  and evaluate  $\frac{dy}{dx}$  when  $x=1$  and  $y=2$

$$\frac{d}{dx} = \frac{d}{dx}(4x^2) + \frac{d}{dx}(2xy^3) - \frac{d}{dx}(5y^2) = 0$$

$$= 8x + 2y^3 + 6xy^2 \frac{dy}{dx} - 10y \frac{dy}{dx} = 0$$

$$6xy^2 \frac{dy}{dx} - 10y \frac{dy}{dx} = -8x - 2y^3$$

$$\frac{dy}{dx} (6xy^2 - 10y) = -8x - 2y^3$$

$$\frac{dy}{dx} = \frac{-8x - 2y^3}{6xy^2 - 10y}$$

$$6xy^2 - 10y //$$