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Computer Engineering

MATH 104 Due 16<sup>th</sup>

i)  $y = t^3 - t^{2/2} - 2t + 4$

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

$$\text{at s.p } \frac{dy}{dt} = 0$$

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

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

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

$$3t + 2 = 0, t - 1 = 0$$

$$t = -2/3, t = 1$$

ii) Coordinate of s.p

$$\text{at } t = -2/3$$

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

$$y = \frac{88}{27} \text{ or } 3.25$$

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

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

$$y = 5/2$$

coordinate of s.p  $(-2/3, 88/27)$  and  $(1, 5/2)$

Nature of s.p

$$d^2y/dx^2 = 6t - 1$$

$$\text{at } t = -2/3$$

$$(-12/3) - 1 = 5$$

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

$$d^2y/dx^2 = 6(1) - 1 \\ = 6 - 1 = 5$$

at 1, 5/2 there is minimum profit

$$2 \quad 2y^2 - 5x^4 - 2 - y^3 = 0$$

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

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

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

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

$$3 \quad 4x^2 + 2xy^3 - 5y^2 = 0$$

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

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

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

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

$\frac{dy}{dx}$  when  $x = 1$  and  $y = 2$

$$\frac{dy}{dx} = \frac{8(1) + 2(2)^3}{2(1) \cdot 3(2)^2 - 10(2)} = \frac{24}{28} = \frac{6}{7}$$