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COMPUTER ENGINEERING (19/ENG02/054)
MAT 104 ASSIGNMENT (Serial No: 130)
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1) a) $y = t^3 - t^2/2 - 2t + 4$

At stationary point, $dy/dx = 0$

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

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

$-6t^2$

$-3t \quad 2t$

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

$3t(t-1) \quad 2(t-1) = 0$

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

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

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

At stationary points, $t = -2/3$ and 1

b) Coordinate of stationary point

At $t = -2/3$, $y = (-2/3)^3 - [(2/3)^2 \div 2] - (2 \times -2/3) + 4$

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

$y = 130/27$

At $t = 1$, $y = (1)^3 - (1^2)/2 - 2(1) + 4$

$y = 1 - 1/2 - 2 + 4$

$y = 5/2$

Coordinates are $(-2/3, 130/27)$ and $(1, 5/2)$

c) Nature of the stationary point of the curve

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

recall that $t = -2/3$ and 1

$\therefore$ at $t = -2/3$, $d^2y/dx^2 = 6(-2/3) - 1$

$d^2y/dx^2 = -4 - 1 = -5$

at $t = 1$, $d^2y/dx^2 = 6(1) - 1$

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

Nature of stationary point: at $t = -2/3$, we have a maximum point

at $t = 1$, we have a minimum point

2. If $2y^2 - 5x^4 - 2 - 7y^3 = 0$, find dy/dx

$$4y\,dy/dx - 20x^3 - 0 - 21y^2\,dy/dx = 0$$

$$4y\,dy/dx - 21y^2\,dy/dx = 20x^3$$

$$dy/dx\,(4y - 21y^2) = 20x^3$$

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

3. $4x^2 + 2xy^3 - 5y^2 = 0$, find dy/dx. Evaluate dy/dx when $x = 1$ and $y = 2$

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

$$6xy^2\,dy/dx - 10y\,dy/dx = -8x - 2y^3$$

$$dy/dx\,(6xy^2 - 10y) = -8x - 2y^3$$

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

When $x = 1$ and $y = 2$, $dy/dx = \dfrac{-8(1) - 2(2)^3}{6(1)(2)^2 - 10(2)}$

$$= \frac{-8 - 16}{24 - 20} = \frac{-24}{4}$$

$$= -6$$