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DEPARTMENT: COMPUTER ENGINEERING
MATRIC NO: 19/ENG02/036
COURSE: MAT 104

01. $y = t^3 - t^{2}/2 - 2t + 4$

at stationary point, $dy/dt = 0$

$dy/dt = 3t^2 - t - 2$

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

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

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

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

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

$\frac{3t}{3} = -2/3$ $\quad t = 1$

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

Stationary Points are $= -2/3$ or 1

At $t = -2/3$

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

$y = -8/27 - 2/9 + 4/3 + 4$

$y = 4.8$

A $t = 1$

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

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

$y = 2.5$

for nature of the stationary point

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

At $t = -2/3$

$6(-2/3) - 1$

$$\frac{d^2y}{dt^2} = -4 - 1$$

$$\frac{d^2y}{dt^2} = -5$$

At $t = 1$

$6(1) - 1$

$6 - 1$

$$\frac{d^2y}{dt^2} = 5$$

$\therefore$ at $t = -2/3$, we have a maximum point and at $t = 1$, we have a minimum point

02. $2y^2 - 5x^4 - 2 - 7y^3 = 0$

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

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

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

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

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

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

03. $4x^2 + 2xy^3 - 5y^2 = 0$

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

$$8x + 2y^3 + 6xy^2 \cdot dy/dx - 10y \cdot dy/dx = 0$$

$6xy^2 \cdot dy/dx - 10y \cdot dy/dx + 8x + 2y^3 = 0$

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

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

at $x = 1$

$4(1)^2 + 2(1)y^3 - 5y^2 = 0$

$4 + 2y^3 - 5y^2 = 0$

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

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

$6y^2 \cdot dy/dx - 10y \cdot dy/dx = 0$

$dy/dx = -6y^2 + 10y$ //

at $y = 2$

$4x^2 + 2x(2)^3 - 5(2)^2 = 0$

$4x^2 + 16x - 20 = 0$

$4x^2 + 16x = 20$

$$\frac{d(4x^2)}{dx} + \frac{d(16x)}{dx} = \frac{d(20)}{dx}$$

$8x + 16$

$dy/dx = 8x + 16$ //

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