ISAAC ENE GRACE
BIOMEDICAL ENGINEERING 19/ENG06/006

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

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

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

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

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

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

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

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

when $t = -2/3$

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

$= -8/27 - \left(\frac{4/9}{2}\right) + \left(4/3\right) + 4$

$\therefore -8/27 - 2/9 + 4/3 + 4$

$= 130/27.$

when $t = 1$

$(1)^3 - \left(\frac{1^2}{2}\right) - 2(1) + 4$

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

$= 5/2$

The co-ordinates are $\left[-2/3, \frac{130}{27}\right]$ and $\left(1, 5/2\right)$

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

When $t = -2/3$

$= 6\left(-2/3\right) - 1$

$= -4 - 1$

$= -5$

when $t = 1$

$6(1) - 1 = 5$

Or 5

$\therefore$ at $\left(-2/3, \frac{130}{27}\right)$, we have a maximum point

at $\left(1, 5/2\right)$, we have a minimum point.

(2) $2y^2 - 5x^2 -$

$4y\frac{dy}{dx}$

$4y\frac{dy}{dx}$

$\frac{dy}{dx}$

$\frac{dy}{dx}$

(3) 4

(2) $2y^2 - 5x^4 - 2 - 7y^3 = 0$

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

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

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

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

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

$$8x + 2y^3 + 2x\left(3y^2\frac{dy}{dx}\right) - 10y\frac{dy}{dx} = 0$$

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

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

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

$$\therefore \frac{dy}{dx} = \frac{8x + 2y^3}{10y - 6xy^2} = \frac{2(4x + y^3)}{2(5y - 3xy^2)}$$

$$= \frac{dy}{dx} = \frac{4x + y^3}{5y - 3xy} \quad \text{when } x = 1,\ y = 2$$

$$\frac{dy}{dx} = \frac{4(1) + (2)^3}{5(2) - 3(1)(2)} = \frac{4 + 8}{10 - 6} = \frac{12}{4} = 3$$