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Bio Medical Engineering

-1/ $y = t^3 - \frac{t^2}{2} - 2t - 4$

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

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

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

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

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

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

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

When $t = 1$

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

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

$= 5/2$

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

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

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

$= -8/22 - 4/9 + 4/3 + 4$

$= 130/27$ ∴ The coordinates are $\left(-\frac{2}{3}, 130/27\right)$ and $\left(1, 5/2\right)$

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

when $t = -2/3$: $6\left(\frac{-2}{3}\right) - 1$

$= -4 - 1$

$= -5$

when $t = 1$: $6(1) - 1 =$

$6 - 1$

5

at $\left(\frac{2}{3}, \frac{130}{27}\right)$ or at $\left(1, \frac{5}{2}\right)$ we

We have a maximum point — We have a minimum point

c) $4y^2 - 5x^4 - 2 - 7y^3 = 0$ Find dy/dx

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

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

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

3) $4x^2 + 12xy^3 - 5y^2 = 0$ find $\frac{dy}{dx}$

$8x + 2y^3 + 6x\left(3y^2\frac{dy}{dx}\right) - 10y\frac{dy}{dx} = 0$

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

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

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

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

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

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

$= 3$//