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Course: Mat 104

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

Let $u = t^3 - t^2$ $v = 2 - 2t + 4$

Using the quotient rule

$$\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$$

$\frac{du}{dx} = 3t^2 - 2t$ $\frac{dv}{dt} = -2$

~~$\frac{dy}{dx} = 3t^2 - 2t$~~ $= \frac{(2 - 2t + 4)(3t^2 - 2t) - (t^3 - t^2)(-2)}{(2 - 2t + 4)^2}$

$= \frac{6t^2 - 4t - 6t^3 + 4t^2 + 12t^2 - 8t + 2t^3 - 2t^2}{(2 - 2t + 4)^2}$

$= \frac{-4t^3 + 20t^2 - 12t}{(2 - 2t + 4)^2}$

For a stationary Point

$$\frac{dy}{dt} = 0$$

$$\frac{t(t^2 - 5t + 3)}{(3-t)^2} = 0$$

$$t = \frac{5 - \sqrt{13}}{2} \simeq 0.697$$

$$t = 0$$

$$t = \frac{\sqrt{13} + 5}{2} \simeq 4.303$$

When $t = 0.697$

$$y = \frac{(0.697)^3 - (0.697)^2}{2 - 2(0.697) + 4}$$

$$y = -0.03$$

$(t = 0.697, y = -0.03)$

When $t = 0$

$$y = \frac{(0)^3 - (0)^2}{2 - 2(0.697) + 4}$$

$x = 0, y = 0$

When $x = 4.303$

$$y = \frac{(4.303)^3 - (4.303)^2}{2 - 2(4.303) + 4}$$

$$y = -23.47$$

$(x = 4.303, y = -23.47)$

$2y^3 - 5x^2 x - 2 - 2y^3 = 0$. Find $\frac{dy}{dx}$

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

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

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

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

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

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

$$\frac{dy}{dx} \quad \frac{-3x - 2y^3}{3xy^2 - 10y}$$

$$\frac{dy}{dx} \quad (x=1, y=2)$$

$$\frac{dy}{dx} = \frac{-3(1) - 2(2)^3}{3(1)(2)^2 - 10(2)}$$

$$= -6$$

$$\frac{dy}{dx} \text{ at } x=1, y=2 \text{ is } -6$$