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1.) $y = t^3 - t^2/2 - 2t + 4$

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 $t - 1 = 0$

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

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

stationary points are $-2/3$ or 1

At $t = -2/3$

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

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

$y = 4.8$

y_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 $t = 1$

$$6(1) - 1$$

$$6 - 1$$

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

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

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

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

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

$= \frac{d(2)}{dx}$

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

$= 0$

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

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

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

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

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

$= \frac{d(0)}{dx}$

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

$dy/dx = 0$

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

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

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

at $x = 1$

$$dy/dx = \frac{-8(1) - 2y^3}{6(1)y^2 - 10y}$$

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

at $y = 2$

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

$$dy/dx = \frac{-8x - 16}{24x - 20}$$ //