

The coordinates are $(1.22, 2.64)$ or $(-0.55, 4.78)$

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

where $t = 1.22$

$$\frac{d^2y}{dt^2} = 6(1.22) - 2$$

$$= 7.32 - 2$$

$$= 5.32$$

At $(1.22, 2.64)$ we have a maximum point

where $t = -0.55$

$$\frac{d^2y}{dt^2} = 6(-0.55) - 2$$

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

$$= 3.3 - 2$$

$$= -5.3$$

\therefore At $(-0.55, 4.78)$ we have a minimum point

$$\textcircled{2} \quad 2y^2 - 5x^4 - z - 7y^2 = 0$$

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

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

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

$$\textcircled{3} \quad 4x^2 + 2xy^3 - 5y^2 = 0$$

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

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

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

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

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

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MAKING argument

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

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

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

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

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

$$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$t = \frac{2 \pm \sqrt{4 + 24}}{6}$$

$$t = \frac{2 \pm \sqrt{28}}{6}$$

$$t = \frac{2 + 5.29}{6} \quad \text{or} \quad t = \frac{2 - 5.29}{6}$$

$$\Rightarrow t = 7.29 \quad \text{or} \quad t = -3.29$$

$$\Rightarrow t = 1.22 \quad \text{or} \quad t = -0.55$$

When $t = 1.22$

$$y = \frac{(1.22)^3 - (1.2)^2}{2} - 2(1.22) + 4$$

$$y = 1.82 - 0.74 - 2.44 + 4$$

$$y = 2.64$$

When $t = -0.55$

$$y = \frac{(0.55)^3 - (-0.55)^2}{2} - 2(-0.55) + 4$$

$$y = -0.17 - 0.15 + 1.1 + 4$$

$$y = 4.28$$

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

when $x = 1$

$$\begin{aligned}\frac{dy}{dx} &= \frac{-4(1) - y^3}{3(1)y - 5y} \\ &= \frac{-4 - y^3}{3y^2 - 5y}\end{aligned}$$

when $y = 2$

$$\begin{aligned}\frac{dy}{dx} &= \frac{-4x - (2)^3}{3x(2)^2 - 5(2)} \\ &= \frac{-4x - 8}{12x - 10} \\ &= \frac{2(-2x - 4)}{2(6x - 5)} \\ &= \frac{-2x - 4}{6x - 5}\end{aligned}$$