

① $y = t^3 - \frac{t^2}{2} - 2t + 4$

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

$\frac{dy}{dx} = 8t^2$ $\frac{dy}{dt} = 3t^2 - t - 2$

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

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

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

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

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

$3t = -2$ $t = 1$

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

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

$y = \left(-\frac{2}{3}\right)^3 - \frac{\left(-\frac{2}{3}\right)^2}{2} - 2\left(-\frac{2}{3}\right) + 4$
 $= -0.216 - 0.18 + 1.2 + 4$

~~$y = 4.804$~~ $y = 4.804$

At $t = 1$

$y = (1)^3 - \frac{(1)^2}{2} - 2(1) + 4$
 $1 - 0.5 - 2 + 4$

$y = 5/2$

$\frac{d^2y}{dt^2} = 6t$ $\left(-\frac{2}{3}, 4.804\right) \quad \left(1, \frac{5}{2}\right)$

$\frac{d^2y}{dt^2} = 6\left(-\frac{2}{3}\right)$
 $= -4$ minimum

$\frac{d^2y}{dt^2} = 6(1)$
 $= 6$ maximum

$$(2) \quad 2y^2 - 5x^4 - 2 - 7y^3 = 0 \quad \frac{dy}{dx}$$

~~$$4y \left[\frac{dy}{dx} \right] - 20x^3$$~~

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

$$\left[\frac{d}{dx} \right] 2y^2 \left[\frac{d}{dx} \right] - 5x^4 \left[\frac{d}{dx} \right] - 7y^3 = \left[\frac{d}{dx} \right] 2$$

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

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

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

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

$$(3) \quad 4x^2 + 2xy^3 - 5y^2 = 0 \quad \text{at } x=1 \quad y=2$$

$$\left[\frac{d}{dx} \right] 4x^2 + \left[\frac{d}{dx} \right] 2xy^3 - \left[\frac{d}{dx} \right] 5y^2 = 0$$

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

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

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

$$\text{at } x=1 \quad y=2$$

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

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

$$\frac{dy}{dx} = \frac{-24}{4}$$

$$\frac{dy}{dx} = -6$$