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

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

using the quotient rule

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

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

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

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

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

$$= -\frac{4(-t^2+5t-3)}{(3-t)^2}$$

$$\frac{dv}{dt} = t\left(\frac{-t^2+5t-3}{(3-t)^2}\right)$$

for a stationary p

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

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

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

$$t = 0$$

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

when $t = 0.697$

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

$y = -0.03$

$(t = 0.6.7,\ y = -0.03)$

when $t = 0$

$$y = \frac{(0)^3 - 0)}{2 - 2(0.097) + 4}$$

$y = 0$

$(t = 0, y = 0)$

when $t = 4.303$

$$y = \frac{(4.303)^3 - 4(303)^2}{2 - 2(4.208) + 4}$$

$y = -23.47$

$t = (4.303,\ y = -23.411)$

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

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

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

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

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

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

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

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

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

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

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

$= -6$

dy/dx at $x=1, y=2$ is -6 ✓