[2][a] $y = \boxed{-t^5 + 5t^3 - 4t = 0}$ $\frac{1}{2}$

$-t(t^4 - 5t^2 + 4) = 0$

$\boxed{-t(t^2-1)(t^2-4) = 0}$ $\frac{1}{2}$

$\boxed{t = 0, 1, -1, 2, -2}$ $\frac{1}{2}$

$x = -1, -5, 3, 3, -5 \longrightarrow (x, y) = \boxed{(-1, 0), (-5, 0), (3, 0)}$ $\frac{1}{2}$

[b] $\frac{dx}{dt} = 6t^2 - 6 = 0$ $\frac{1}{2}$

$\frac{1}{2}$ $t = \pm 1 \longrightarrow (x, y) = (-5, 0), (3, 0)$

[c] $x = 2t^3 - 6t - 1 = -1$

$$\boxed{2t(t^2-3)=0} \quad \frac{1}{2}$$

Q P

$$t = 0, \sqrt{3}, -\sqrt{3} \longrightarrow (x,y) = (-1,0), (-1, 2\sqrt{3}), (-1, -2\sqrt{3})$$

$$\frac{dy}{dx} = \boxed{\frac{-5t^4+15t^2-4}{6t^2-6}} \quad 1 \qquad \frac{dy}{dx}\Bigg|_{\boxed{t=-\sqrt{3}}} = \frac{-5(9)+15(3)-4}{6(3)-6}$$

$\frac{1}{2}$

$$= \frac{-4}{12} = \boxed{-\frac{1}{3}} \quad \frac{1}{2}$$

$$\boxed{y + 2\sqrt{3} = -\frac{1}{3}(x+1)} \quad \frac{1}{2}$$

[d] $$\frac{d^2y}{dx^2} = \boxed{\dfrac{\dfrac{(-20t^3+30t)(6t^2-6)-(-5t^4+15t^2-4)(12t)}{(6t^2-6)^2}}{6t^2-6}} \quad 1\tfrac{1}{2}$$

$$\left.\frac{d^2y}{dx^2}\right|_{\boxed{t=\sqrt{3}}} = \frac{(-20(3\sqrt{3})+30\sqrt{3})(6(3)-6) - (-5(9)+15(3)-4)(12\sqrt{3})}{(6(3)-6)^3}$$

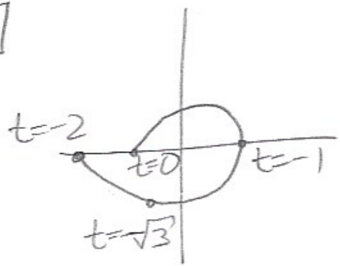
$\frac{1}{2}$

$$= \frac{(-30\sqrt{3})(12)+48\sqrt{3}}{12^3}$$

$$= \frac{-30\sqrt{3}+4\sqrt{3}}{12^2}$$

$$= \frac{-26\sqrt{3}}{144} = \boxed{\frac{-13\sqrt{3}}{72}} \quad \frac{1}{2}$$

[e]



$$1 \quad -\int_{-2}^{-1}(-t^5+5t^3-4t)(6t^2-6)\,dt \quad 1$$

$$1 \quad +\int_{0}^{-1}(-t^5+5t^3-4t)(6t^2-6)\,dt$$

$$= \int_{-1}^{-2}(-t^5+5t^3-4t)(6t^2-6)\,dt$$

$$+\int_{0}^{-1}(-t^5+5t^3-4t)(6t^2-6)\,dt$$

$$= \boxed{\int_{0}^{-2}(-t^5+5t^3-4t)(6t^2-6)\,dt} \quad \frac{1}{2}$$

[3][a] $x = \frac{t^4+4}{t^2} = 5$

$$t^4+4=5t^2$$

$$t^4-5t^2+4=0$$

$$\boxed{(t^2-1)(t^2-4)=0} \quad \frac{1}{2}$$

$$t = 1, 2, \underbrace{\cancel{-1}, \cancel{-2}}_{\text{UNDEFINED } y}$$

$x = t^2+4t^{-2} \qquad y = 8\ln t - 4$

$$\frac{dx}{dt} = 2t-8t^{-3} \qquad \frac{dy}{dt} = 8t^{-1}$$

$$\boxed{\sqrt{(2t-8t^{-3})^2+(8t^{-1})^2}} \quad 1$$

$$= \sqrt{(4t^2-32t^{-2}+64t^{-6})+64t^{-2}}$$

$$= \boxed{\sqrt{4t^2+32t^{-2}+64t^{-6}}} \quad 1$$

$$= |2t+8t^{-3}| = \boxed{2t+8t^{-3}} \quad \frac{1}{2}$$

$$t \in [1,2]$$

$$1 \quad \boxed{\int_1^2}(2t+8t^{-3})\,dt \underset{\frac{1}{2}}{=} \boxed{(t^2-4t^{-2})}\Big|_1^2 = (4-1)-4\left(\tfrac{1}{4}-1\right)$$

$$= 4-1-1+4$$

$$= \boxed{6} \quad \frac{1}{2}$$

[b] $\boxed{\int_1^2 2\pi(t^2+4t^{-2})(2t+8t^{-3})\,dt}$ $\frac{1}{2}$

$$= 2\pi\int_1^2 \left(\boxed{2t^3+16t^{-1}+32t^{-5}}\right)dt$$ 1

$$= 2\pi\left(\boxed{\tfrac{1}{2}t^4+16\ln|t|-8t^{-4}}\right)\Big|_1^2$$ 1

$$= 2\pi\left(\tfrac{1}{2}(16-1)+16\ln 2-8\left(\tfrac{1}{16}-1\right)\right)$$

$$= 2\pi\left(\tfrac{15}{2}+16\ln 2+\tfrac{15}{2}\right)$$

$$= \boxed{2\pi(15+16\ln 2)}$$ $\frac{1}{2}$