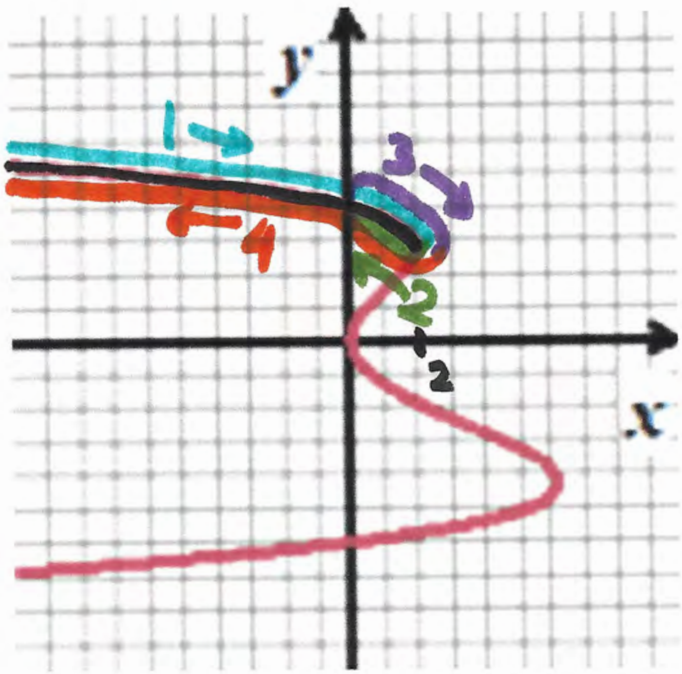
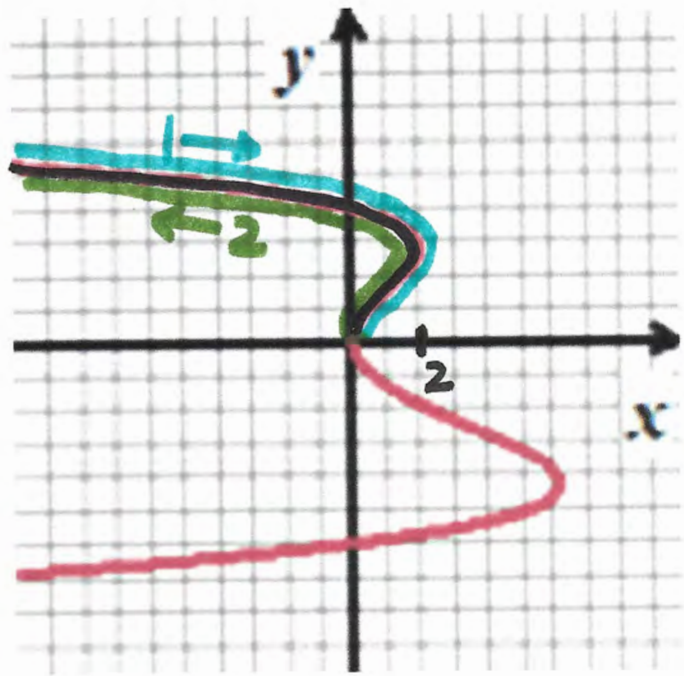
[2] AS $t$ GOES FROM $-\infty$ TO $-6$ TO $-3$ TO $0$ TO $\infty$

$\boxed{\text{X GOES FROM } -\infty \text{ TO } 2 \text{ TO } 0 \text{ TO } 2 \text{ TO } \infty}$ 4

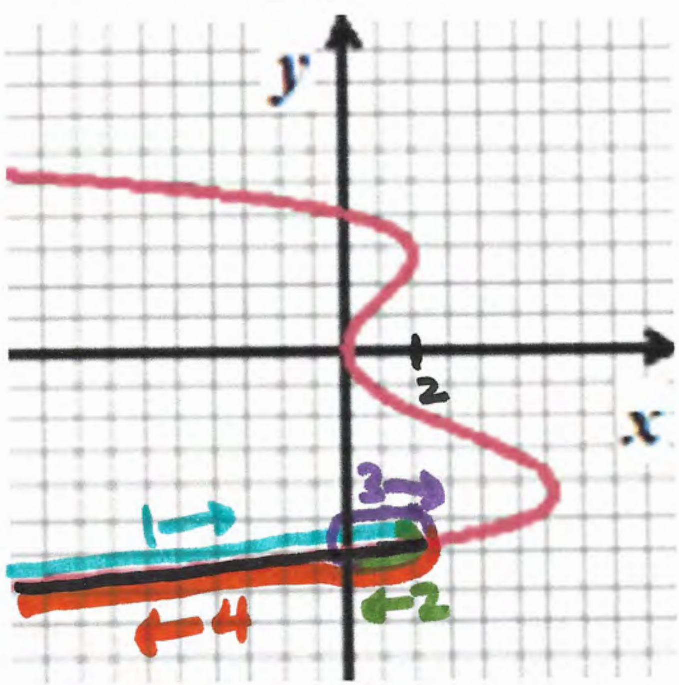
SOLUTION 1:




SOLUTION 2:




SOLUTION 3:




3 FOR EACH OF TWO GRAPHS

[3] $\ln(1-x^6) = (-x^6) - \frac{(-x^6)^2}{2} + \frac{(-x^6)^3}{3} - \cdots$

$$= 3\ \boxed{-x^6 - \frac{1}{2}x^{12} - \frac{1}{3}x^{18}} - \cdots$$

$$1+\cos 2x^3 = 1 + \left(1 - \frac{(2x^3)^2}{2!} + \frac{(2x^3)^4}{4!} - \cdots\right)$$

$$= 3\ \boxed{2 - 2x^6 + \frac{2}{3}x^{12}} - \cdots$$

$$\begin{array}{r|l} & -\frac{1}{2}x^6 - \frac{3}{4}x^{12} - \frac{3}{4}x^{18} \\ \hline 2 - 2x^6 + \frac{2}{3}x^{12} & -x^6 - \frac{1}{2}x^{12} - \frac{1}{3}x^{18} \\ & 3\ \boxed{-x^6 + x^{12} - \frac{1}{3}x^{18}} \\ \hline & 1\ \boxed{-\frac{3}{2}x^{12}} \\ & 2\ \boxed{-\frac{3}{2}x^{12} + \frac{3}{2}x^{18}} \\ \hline & 1\ \boxed{-\frac{3}{2}x^{18}} \end{array}$$

5

$$\frac{\ln(1-x^6)}{1+\cos 2x^3} = \boxed{-\frac{1}{2}x^6 - \frac{3}{4}x^{12} - \frac{3}{4}x^{18}} - \cdots$$

[4] $\boxed{\cancel{2}-3t^2+4t^3=\cancel{2}}$ 3

$\boxed{t^2(4t-3)=0 \longrightarrow t=0,\ \tfrac{3}{4}}$ 2

$t=0 \longrightarrow x=2\cos 0-1=1$ 1

$t=\tfrac{3}{4} \longrightarrow x=2\cos\tfrac{3\pi}{4}-1=-\sqrt{2}-1 \neq 1$ 1

6

$$\frac{dy}{dx}=\boxed{\frac{-6t+12t^2}{-2\pi\sin\pi t}}=\frac{3t-6t^2}{\pi\sin\pi t} \qquad \frac{0}{0} \text{ IF } t=0$$

$$\left.\frac{dy}{dx}\right|_{t=0}=\boxed{\lim_{t\to 0}\frac{3t-6t^2}{\pi\sin\pi t}}=\boxed{\lim_{t\to 0}\frac{3-12t}{\pi^2\cos\pi t}}=\boxed{\frac{3}{\pi^2}}\ 2$$

3 3

$\boxed{y-2=\frac{3}{\pi^2}(x-1)}$ 3

[5] $\boxed{-1 < 3x^2 < 1}$ FROM RADIUS OF arctan x P.768

4

$0 \le 3x^2 < 1$

$\boxed{0 \le x^2 < \frac{1}{3}}$ 2

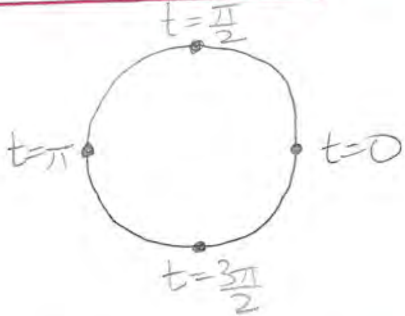
$\boxed{-\frac{1}{\sqrt{3}} < x < \frac{1}{\sqrt{3}}}$ 2 RADIUS = $\boxed{\frac{1}{\sqrt{3}}}$ 1

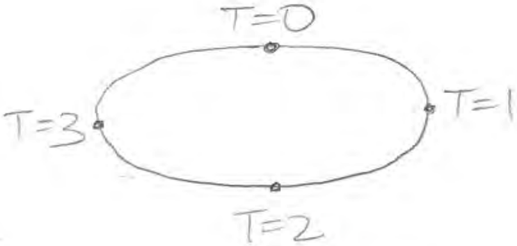
[6] CENTER = $\boxed{\left(\frac{-4+1}{2}, \frac{2+-1}{2}\right) = \left(-\frac{3}{2}, \frac{1}{2}\right)}$ 2

SEMI-MAJOR AXIS = $\boxed{\frac{1--4}{2} = \frac{5}{2}}$ 2 "HORIZONTAL RADIUS"

SEMI-MINOR AXIS = $\boxed{\frac{2--1}{2} = \frac{3}{2}}$ 2 "VERTICAL RADIUS"

6 $\boxed{\begin{aligned} x &= \tfrac{5}{2}\cos t - \tfrac{3}{2} \\ y &= \tfrac{3}{2}\sin t + \tfrac{1}{2} \end{aligned}}$




4 $\boxed{\begin{array}{ccccc} T & 0 & 1 & 2 & 3 \\ t & \frac{\pi}{2} & 0 & -\frac{\pi}{2} & -\pi \end{array}}$ ANY 2 PAIRS

$t = mT + b$

2 $\boxed{m = \frac{\Delta t}{\Delta T} = \frac{\frac{\pi}{2} - 0}{0 - 1} = -\frac{\pi}{2}}$

1 $\boxed{b = \frac{\pi}{2}}$

2 $\boxed{t = -\frac{\pi}{2}T + \frac{\pi}{2}} = \frac{\pi}{2}(1-T)$

3 $\boxed{\begin{aligned} x &= \tfrac{5}{2}\cos \tfrac{\pi}{2}(1-T) - \tfrac{3}{2} \\ y &= \tfrac{3}{2}\sin \tfrac{\pi}{2}(1-T) + \tfrac{1}{2} \end{aligned}}$

[7] $f(x) = (2 - x^{\frac{1}{2}})^{-1} \longrightarrow f(1) = \boxed{1}$ 1

$f'(x) = \boxed{-(2-x^{\frac{1}{2}})^{-2}(-\frac{1}{2}x^{-\frac{1}{2}})}$ 3 $= \frac{1}{2}x^{-\frac{1}{2}}(2-x^{\frac{1}{2}})^{-2} \longrightarrow f'(1) = \boxed{\frac{1}{2}}$ 2

$f''(x) = \boxed{-\frac{1}{4}x^{-\frac{3}{2}}(2-x^{\frac{1}{2}})^{-2}}$ 2 $+ \boxed{\frac{1}{2}x^{-\frac{1}{2}}\left(-2(2-x^{\frac{1}{2}})^{-3}(-\frac{1}{2}x^{-\frac{1}{2}})\right)} \longrightarrow$

4

$f''(1) = -\frac{1}{4} + \frac{1}{2} = \boxed{\frac{1}{4}}$ 2

6

$$\frac{1}{2-\sqrt{x}} = \boxed{1 + \frac{1}{2}(x-1) + \frac{1}{8}(x-1)^2} + \cdots$$

[8][a] y-INT $\longrightarrow$ $x = \boxed{0 = 10t^2 + 5t = 5t(2t+1)} \longrightarrow \boxed{t = 0, -\frac{1}{2}}$ 2

3

$$t = 0 \longrightarrow y = 0$$

$$\boxed{t = -\frac{1}{2} \longrightarrow y = -\frac{1}{2} + \frac{3}{4} = \frac{1}{4}}$$ 1

$$\frac{dy}{dx} = \boxed{\frac{12t^2 + 6t}{20t + 5}}$$ 6

$$\frac{d^2y}{dx^2} = \frac{\dfrac{\boxed{(24t+6)(20t+5) - (12t^2+6t)(20)}}{\boxed{(20t+5)^2}}}{\boxed{20t+5}}$$

6

2

2

$$\left.\frac{d^2y}{dx^2}\right|_{t=-\frac{1}{2}} = \boxed{\frac{(-6)\cancel{(-5)} - \cancel{(0)(20)}}{(-5)^{3}} = -\frac{6}{25}}$$ 2

[b] $\frac{dx}{dt} = \boxed{\overset{4}{20}t + 5 = 0 \longrightarrow t = -\frac{1}{4}}$ NOTE: $\boxed{\left.\frac{dy}{dt}\right|_{t=-\frac{1}{4}} = \frac{3}{4} - \frac{3}{2} = -\frac{3}{4} \neq 0}$ 2

V.T.L. 3 4 5

$$\boxed{\int_{-\frac{1}{4}}^{-\frac{1}{2}}} \boxed{(4t^3 + 3t^2)(20t+5)\,dt} \boxed{- \int_{-\frac{1}{4}}^{0}} \boxed{(4t^3+3t^2)(20t+5)\,dt}$$

$$= \int_{-\frac{1}{4}}^{-\frac{1}{2}} (4t^3+3t^2)(20t+5)\,dt + \int_{0}^{-\frac{1}{4}} (4t^3+3t^2)(20t+5)\,dt$$

3

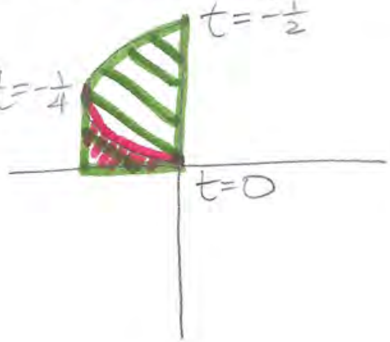
$$= \int_{0}^{-\frac{1}{2}} (\boxed{80t^4 + 80t^3 + 15t^2})\,dt$$

3

$$= (\boxed{16t^5 + 20t^4 + 5t^3})\Big|_{0}^{-\frac{1}{2}}$$

2

$$= \boxed{-\frac{1}{2} + \frac{5}{4} - \frac{5}{8} = \frac{-4+10-5}{8} = \frac{1}{8}}$$



[9] $\frac{1}{2^1} + \frac{1}{2\cdot 2^2} - \frac{1}{3\cdot 2^3} - \frac{1}{4\cdot 2^4} + \frac{1}{5\cdot 2^5} + \frac{1}{6\cdot 2^6} - \cdots$

$$= \left( \boxed{\frac{1}{2} \overset{2}{-} \frac{\left(\frac{1}{2}\right)^3}{3} + \frac{\left(\frac{1}{2}\right)^5}{5} - \cdots} \right) + \overset{2}{\boxed{\frac{1}{2}}} \left( \boxed{\frac{1}{2^2} - \frac{\left(\frac{1}{2^2}\right)^2}{2} \overset{2}{+} \frac{\left(\frac{1}{2^2}\right)^3}{3} - \cdots} \right)$$

$$= \tan^{-1}\frac{1}{2} + \frac{1}{2}\ln\left(1 + \frac{1}{2^2}\right) = \boxed{\tan^{-1}\frac{1}{2} + \frac{1}{2}\ln\frac{5}{4}} \; 4$$

[10] $\boxed{f^{(n)}(x) = p(p-1)(p-2)\cdots(p-n+1)\,x^{p-n}}$ 4

2 NO FACTOR IS 0 SINCE p IS NOT A NON-NEGATIVE INTEGER AND n IS

AND FOR ALL n > p, p-n WILL BE NEGATIVE, SO $0^{p-n}$ DNE
2

AND $f^{(n)}(0)$ DNE 2

SO, MACLAURIN SERIES DNE