Period 3, April 16, 2025

1, 3, 7, 8, 10, 4, 12, 11, 18, 15, 16, 17, 18, 19, 22, 27, 23, 25, 29, 30, 24, 31, 39, 38, 36, 37, 32, 33, 34, 35, 40, 41, 42, 44, 45

(1)

$\lim_{x \to 2} \frac{x^2-2}{4-x^2} = \frac{2}{RSN} = \infty = \phi$

Plug in 2 $\frac{4}{0} = \phi \Rightarrow \infty, -\infty$

$\frac{2}{RSN} = \infty$

(3) $y = \frac{e^{\ln u}}{u}$

$\frac{dy}{du} = \frac{e^{\ln u} \cdot \frac{1}{u} \cdot \cancel{u} - e^{\ln u} \cdot 1}{u^2} = \frac{e^{\ln u} - e^{\ln u}}{u^2} = \frac{0}{u^2} = 0$

(4) $F(x) = \sqrt{9 + \sin 2x}$ at $x = 0$, $y = F(0) = 3$

$(0,3)$ $m = \frac{1}{3}$

$F(x) = (9 + \sin 2x)^{\frac{1}{2}}$

$y - 3 = \frac{1}{3}(x - 0)$

$F'(x) = \frac{1}{2}(9 + \sin 2x)^{-\frac{1}{2}}(0 + (\cos 2x)2)$

$y = \frac{1}{3}x + 3$

$F'(0) = \frac{1}{2}(9+0)^{-\frac{1}{2}}(0 + 1 \cdot 2) = \frac{1}{2} \cdot \frac{1}{3} \cdot 2 = \frac{1}{3}$

$y = \frac{1}{3}(0.06) + 3$

$0.02 + 3$

3.02

(D)

7. $y = x^2 e^{1/x}$ $x \neq 0$

$\frac{dy}{dx} = 2x \cdot e^{\frac{1}{x}} + \cancel{x}^2 \cdot e^{\frac{1}{x}}\left(-\frac{1}{\cancel{x^2}}\right)$

(B)

$\frac{dy}{dx} = 2xe^{\frac{1}{x}} - e^{\frac{1}{x}} = e^{\frac{1}{x}}(2x - 1)$

9

$y = x^2+1$ $\frac{dx}{dT} = \frac{3}{2}$ u/s

$\frac{dy}{dT} = 2x\frac{dx}{dT}$

Point $(1,2)$

How far from origin

$d=\sqrt{5}$

$\frac{dy}{dT} = 2(1)\cdot\frac{3}{2} = 3$ u/s

distance from origin $d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$d=\sqrt{(x-0)^2+(y-0)^2}$

$d^2=x^2+y^2$

$2d\frac{dd}{dT} = 2x\frac{dx}{dT}+2y\frac{dy}{dT}$

$2\cdot d\cdot\frac{dd}{dT} = 2\cdot 1\cdot\frac{3}{2}+2\cdot 2\cdot 3$

$2d\frac{dd}{dT} = 3+12$

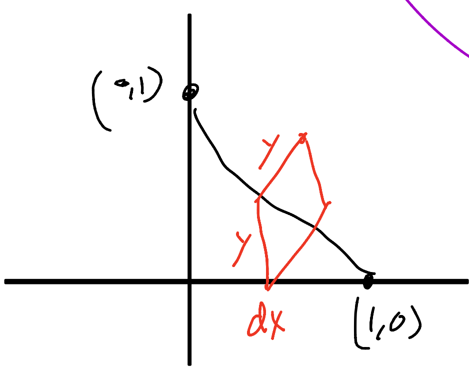
$\cancel{2\sqrt{5}}\frac{dd}{dT} = \frac{15}{2\sqrt{5}}$

$\frac{dd}{dT} = \frac{15\sqrt{5}}{2\sqrt{5}\cdot\sqrt{5}} = \frac{15\sqrt{5}}{2\cdot 5}$

$\frac{3\sqrt{5}}{2}$

B

10



$y=\sqrt{1-x^2}$ Shape?

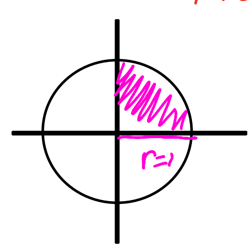
$y^2=1-x^2$

$x^2+y^2=1$ = circle

$y=\sqrt[4]{1-x^2} \Rightarrow y^2=\sqrt{1-x^2}$

$\int_0^1 y^2\,dx = \int_0^1 \sqrt{1-x^2}\,dx = \frac{\pi}{4}$

Area under curve



$\frac{\pi r^2}{4} = \frac{\pi(1)^2}{4} = \frac{\pi}{4}$

(11) $\int \frac{x}{\sqrt{9-x^2}}\,dx$ $\quad u = 9 - x^2$

$du = -2x\,dx$

$\int \frac{\cancel{x}}{\sqrt{u}} \cdot \frac{du}{-2\cancel{x}}$ $\quad \frac{du}{-2x} = dx$ $\quad$ (C)

$-\frac{1}{2}\int u^{-\frac{1}{2}}du = -\frac{1}{\cancel{2}} \cdot \frac{\cancel{2}}{1} \cdot u^{-\frac{1}{2}+1=\frac{1}{2}} = -1\,u^{\frac{1}{2}} = -1\sqrt{u} = -1\sqrt{9-x^2}$

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(12) $\int \frac{(y-1)^2}{2y}dy = \int \frac{y^2-2y+1}{2y}dy = \int\left(\frac{y^2}{2y} - \frac{2y}{2y} + \frac{1}{2y}\right)dy$

$\int\left(\frac{1}{2}y - 1 + \frac{1}{2}\cdot\frac{1}{y}\right)dy$

$\frac{1}{4}y^2 - y + \frac{1}{2}\ln|y| + C$ $\quad$ (A)

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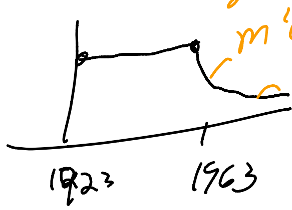
15. 

going Down

$m'(x) = -$

$m''(x) = +$

concave up

$m(x) = +$

(C)

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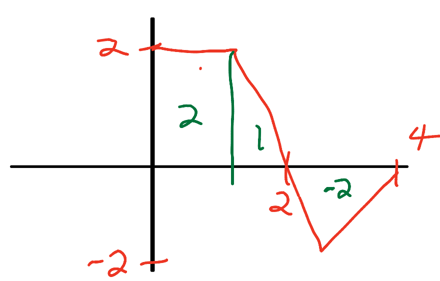
(16) $G(x) = \int_0^x F(T)\,dT$

$H(x) = \int_2^x F(T)\,dt$



(d)

$G(2) = 3$

$H(2) = 0$

$\cancel{H(x) = G(x)}$

$\cancel{g'(x) = H'(x+2)}$

$\cancel{F(x) = F(x+2)}$

$\cancel{F(1) = F(3)}$

$\cancel{2 = -2}$

$\cancel{G(x) = H(x+2)}$

$\cancel{G(2) = H(4)}$

$\cancel{3 = -2}$

$G(x) = H(x) + 3$

$G(2) = H(2) + 3$

$3 = 0 + 3$

True

17.

$F(x)=x^2+\frac{2}{x}$ $\qquad \frac{1}{2}\le x\le 2$

$F'(x)=2x+2\cdot -1\cdot x^{-2}$

$0=2x-\frac{2}{x^2}$

$x^2\cdot\frac{2}{x^2}=2x\cdot x^2$

$2=2x^3$

$x=1$

$F'(0)=\phi$

$F(\frac{1}{2})=(\frac{1}{2})^2+\frac{2}{\frac{1}{2}}=\frac{1}{4}+4=\frac{41}{4}$

$F(2)=2^2+\frac{2}{2}=4+1=5$

$F(1)=1^2+\frac{2}{1}=1+2=3$

$-2(x^2-1)=-2(x-1)(x+1)$

A

x=+ Less Than 1

$-1<x<1$ $\frac{dy}{2dx}=+$

18

$y=\frac{2x}{x^2+1}\Rightarrow\frac{dy}{dx}=\frac{2(x^2+1)-2x\cdot 2x}{(x^2+1)^2}=\frac{2x^2+2-4x^2}{(x^2+1)^2}=\frac{-2x^2+2}{(x^2+1)^2}$

$y=\frac{x^2}{x^2+1}\Rightarrow\frac{2x(x^2+1)-x^2\cdot 2x}{(x^2+1)^2}=\frac{\cancel{2x^3}+2x-\cancel{2x^3}}{(x^2+1)^2}=\frac{2x}{(x^2+1)^2}$ when x=+ $\frac{dy}{dx}$ + x=− $\frac{dy}{dx}$ −

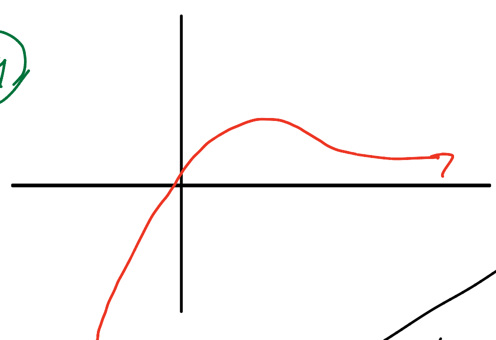
Curve is not Sign

$y=\sin x \Rightarrow \cos x \qquad =\cos x$

$y=e^{-x^2}\Rightarrow\frac{dy}{dx}=e^{-x^2}\cdot -2x \qquad =\frac{-2x}{e^{x^2}}$ when x=+ $\frac{dy}{dx}=-$ x=− $\frac{dy}{dx}=+$

Not on Field

19



$\lim_{x\to\infty}F(x)=0$

$\lim_{x\to-\infty}F(x)=-\infty$

$\cancel{F(x)=xe^x}$

$\cancel{\Rightarrow\lim_{x\to\infty}xe^x=\infty}$

$\cancel{F(x)=\frac{x}{x^2+1}}$

$\lim_{x\to\infty}\frac{x}{x^2+1}=0$

$\lim_{x\to-\infty}\frac{x}{x^2+1}=0$

$F(x)=\frac{x^2}{x^3+1}$ $\cdot\frac{1}{\text{RBN}}$

$\lim_{x\to\infty}F(x)=0$

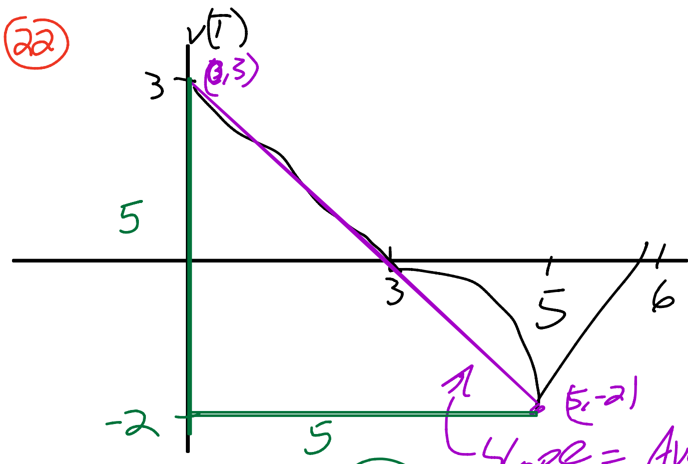
$\lim_{x\to-\infty}F(x)=0$

$F(x)=\frac{x}{e^x}$ $\qquad \lim_{x\to\infty}\frac{x}{e^x}=0$

$\lim_{x\to-\infty}\frac{x}{e^x}=-\infty$

B

(22)



Slope = Average a(t)

$m = -1$

average (a(T))

$V'(T) = a(T)$

Slope of $V(T) = a(T)$

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(23)

$y = \frac{2x^2}{4-x^2} = \frac{2x^2}{(2-x)(2+x)}$ Vertical asy = $x=2$ and $x=-2$

$\lim_{x \to \pm\infty} \frac{2x^2}{4-x^2} = \frac{2x^2}{-x^2} = -2$

D

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(24)

$F(x) = \begin{cases} x^2 & x < 2 \\ 4 & -2 < x \leq 1 \\ 6-x & x > 1 \end{cases}$

$x \neq 2$ Not continuous

$\lim_{x \to 1^-} F(1) = 4$

Not continuous

$\lim_{x \to 1^+} F(x) = 6 - 1 = 5$

C

25. $F(x)=x^5+3x-2$ Through $(1,2)$

F^{-1} inverse of F $F^{-1}(2)=1$

$$(F^{-1})'(x)=\frac{1}{F'(F^{-1}(x))}$$

$F'(x)=5x^4+3$

$F'(1)=5+3=8$

$$F'(x)'(x)=\frac{1}{F'(F^{-1}(2))}=\frac{1}{F'(1)}$$

$\frac{1}{8}$

13

27, 29

$y=\ln(4+x^2)$

x^2 is always positive

$(-3)^2=(3)^2$ symm over y-axis

$$\frac{dy}{dx}=\frac{1}{4+x^2}\cdot 2x=\frac{2x}{4+x^2}$$

always +

critical value $x=0$

when $x=- \Rightarrow \frac{dy}{dx}=-$

$x=+ \Rightarrow \frac{dy}{dx}=+$

$$\frac{dy}{dx}=\frac{2x}{4+x^2}$$

$$\frac{d^2y}{dx^2}=\frac{2(4+x^2)-2x(2x)}{(4+x^2)^2}=\frac{8+2x^2-4x^2}{(4+x^2)^2}=\frac{-2x^2+8}{(4+x^2)^2}=\frac{-2(x^2-4)}{(4+x^2)^2}$$

$$\frac{-2(x-2)(x+2)}{(4+x^2)^2}$$

always +

inflection pts

$(2,-2)$

(29) $\lim_{n\to\infty} \sum_{k=1}^{n} \left(\left(\sqrt{\frac{2k}{n}+3}\right)\left(\frac{1}{n}\right)\right)$ interval = 1

$\frac{1}{n} \to dx$

$\int_3^4 \sqrt{2x}\,dx$ $\quad$ ~~$\sqrt{2\cdot 4}$ $\sqrt{8}$~~ $\quad$ $\sqrt{2\cdot 3}$ $\sqrt{6}$

$\lim_{n\to\infty}$ when $k=1$ $\quad \sqrt{0+3}=\sqrt{3}$

$k=n$ $\quad \sqrt{2+3}=\sqrt{5}$

works

$\int_0^1 \sqrt{2x+3}$ $\quad \sqrt{2\cdot 0+3}$ $\quad \sqrt{3}$ $\quad \sqrt{2\cdot 1+3}$ $\quad \sqrt{5}$

$\int_0^1 \sqrt{2x}\,dx$ $\quad$ ~~$\sqrt{2\cdot 0}$ $\sqrt{0}$~~ $\quad \sqrt{2\cdot 1}$ $\sqrt{2}$

$\int_3^4 \sqrt{2x+3}\,dx =$ ~~$\sqrt{2\cdot 4+3}$ $\sqrt{11}$~~ $\quad 2\cdot 3+3$ $\quad \sqrt{9}$

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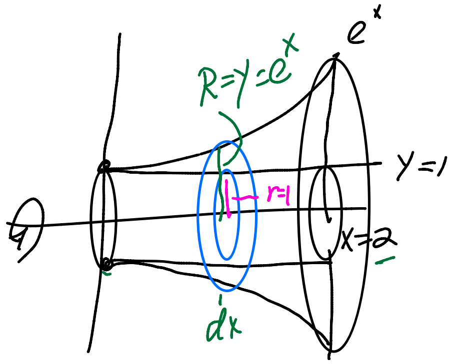
30. $y=e^x$

$y=1$

$x=2$

$e^0=1$



$\pi\int (R^2-r^2)\,dx$

$\pi\int_0^2 \left((e^x)^2-(1)^2\right)dx$

$\pi\int_0^2 (e^{2x}-1)\,dx$

(C)

31,

$V = 12\sqrt{S}$

$$\frac{\cancel{dT}\cdot\frac{ds}{dT}}{S^{\frac{1}{2}}} = 12\sqrt{S} = \frac{12\cdot S^{\frac{1}{2}}\cdot dT}{S^{\frac{1}{2}}}$$

$$\int S^{-\frac{1}{2}}\,ds = \int 12\,dT$$

$$\frac{2}{1}\cdot S^{-\frac{1}{2}+1=\frac{1}{2}} = 12T + C$$

$2\sqrt{S} = 12T + C$

$S = 1$ when $T = 0$

$2\sqrt{1} = 12(0) + C$

$2 = C$

$2\sqrt{S} = 12T + 2$

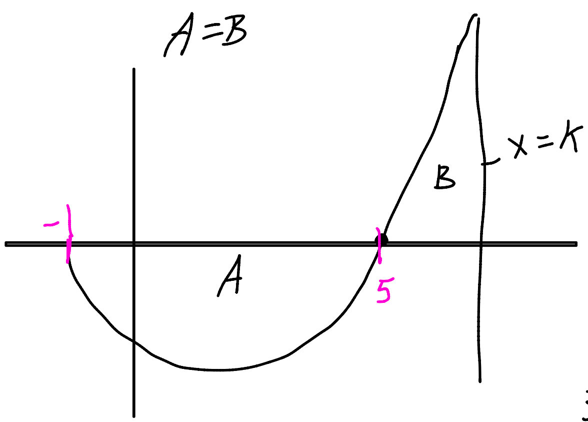
$T = 1$

$2\sqrt{S} = 12(1) + 2$

$2\sqrt{S} = 14$

$\sqrt{S} = 7 \Rightarrow S = 49$

$A = B$



$F(x) = x^2 - 4x - 5$

$0 = (x-5)(x+1)$

$x = 5$ or $x = -1$

$$\int_{-1}^{1}(x^2 - 4x - 5)\,dx = 36$$

$$36 = \int_{5}^{k}(x^2 - 4x - 5)\,dx$$

$$36 = \frac{1}{3}x^3 - 2x^2 - 5x \Big]_{5}^{k}$$

$$36 = \frac{k^3}{3} - 2k^2 - 5k - \left(\frac{1}{3}(5)^3 - 2(5)^2 - 5(5)\right)$$

$P = P_0 e^{kT}$

$T = 0 \quad P = 200$

$200 = P_0 \cdot e^{k \cdot 0} = P_0 \cdot e^0 = P_0$

$P_0 = 200$

$P = 200 e^{kT}$

$T = 10 \quad P = 600$

$\frac{600}{200} = \frac{\cancel{200} e^{10k}}{\cancel{200}}$

$3 = e^{10k}$