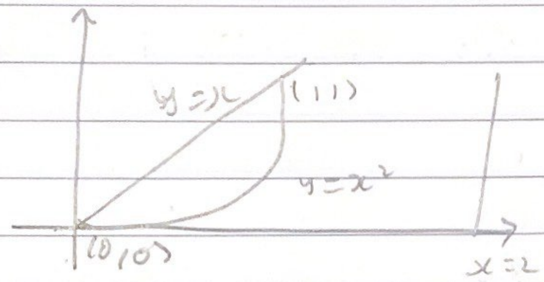
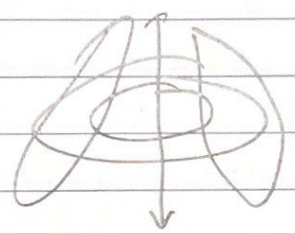
1) $y = x \ , \ y = x^2$ about $x = 2$

a)



b)



c) $R_1 = 2 - \sqrt{y}$

$R_2 = 2 - y$

$$\text{Area} = \pi\left[(2-y)^2 - (2-\sqrt{y})^2\right]$$

$$= \pi\left[4 + y^2 - 4y - 4 - y + 4\sqrt{y}\right]$$

$$= \pi\left[y^2 - 5y + 4\sqrt{y}\right]$$

d) $V = \int_0^1 \pi\left[y^2 - 5y + 4\sqrt{y}\right] dy$

to 2 decimals

e) $V = \pi\cancel{\left[\frac{y^3}{3} - \frac{5}{2}y^2 + \frac{4y^{\frac{3}{2}}}{\frac{3}{2}}\right]_0^1} \rightarrow \frac{\pi}{2} \rightarrow 1.5708$

no FTC2

co-ordinates for y?

2) Density of Water ρ: 62.5

Depth of water h: 3 feet $\quad W(y) = W - \frac{W}{H} y$

Total dep: 6 feet

Width W: 9 feet

length L: 10 feet $\quad W = \int_3^6 62.5 \left(9 - \frac{3}{2} y\right) \cdot 10 \cdot \cancel{(6-y)}\, y \, dy$

3

$W = 62.5 \cdot 10 \cdot \int_3^6 \left(9(6-y) - \frac{3}{2} y (6-y)\right) dy$

no Riemann sum

$W = 62.5 \cdot 10 \cdot \int_3^6 \left(54 - 9y - 9y + \frac{3}{2} y^2\right) dy$

$W = 62.5 \cdot 10 \cdot \int_3^6 \left(54 - 18y + \frac{1}{2} y^2\right) dy$

$W = 62.5 \cdot 10 \cdot \left[54y - 9y^2 + \frac{1}{2} y^3\right]_3^6$

$W = 62.5 \cdot 10 \cdot ([324 - 324 + 108] - [162 - 81 + 13.5])$

$W = \int_0^3 62.5 \times 10 \times \int_0^3 \left(9y - \frac{1}{2} y^2\right) dy$

$W = 625 \times \left[\frac{9}{2} y^2 - \frac{1}{6} y^3\right]_0^3$ no FTC2

$W = 625 \times \left(\frac{81}{2} - \frac{9}{2}\right)$

~~$W = 625 \times 36$~~

$W = 22{,}500$ units?

3) $\frac{35 \text{ kg}}{4 \text{ m}} = 8.75 \text{ kg/m}$

if $m(x)$ is the mass of the bag at height x then kx is not the mass of the rope at height x

$F(x) = g(m(x) + \cancel{k x})$ this is not internally consistent

$F(x) = g \times (m_0 - 8.75x + kx)$

$F(x) = 9.8 \times (70 - 8.75x + 3x)$

$F(x) = 9.8 \times (70 - 5.75x)$

$F(x) = 686 - 56.35x$

5

$W = \int_0^6 (686 - 56.35x)\,dx$

$W = \left[686x - \frac{56.35}{2}x^2\right]_0^6$ not FTC2

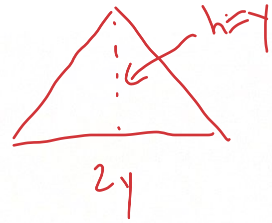
$W = [686 \times 6 - \frac{56.35}{2} \times 6^2]$

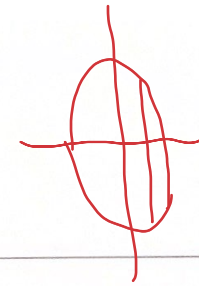
$W = [4116 - 56.35 \times 10]$

$\boxed{W = 3101.7}$ correct by accident

$A = \frac{1}{2} b h$

$= \frac{1}{2}(2y) \cdot y = y^2$





4) $\frac{x^2}{4} + \frac{y^2}{9} = 1$ $\qquad$ $\cancel{A = \frac{1}{2} y^2}$ why?

does not follow

$y = \frac{3}{\cancel{2}}\sqrt{1 - \frac{x^2}{4}} \rightarrow A(x) = \frac{1}{2}\left(\frac{3}{2}\sqrt{1 - \frac{x^2}{4}}\right)^2$

$A(x) = \frac{1}{2}\left(\frac{9}{4}\left(1 - \frac{x^2}{4}\right)\right)$

from $x = -2$ to $x = 2$:

$V = \int_{-2}^{2} \left(\frac{9}{8} - \frac{9x^2}{32}\right) dx$ $\qquad$ $A(x) = \frac{9}{8} - \frac{9x^2}{32}$

$= \int_{-2}^{2} \frac{9}{8}\, dx = \left[\frac{9}{8} x\right]_{-2}^{2}$ $\qquad$ $V = \int_{-2}^{2} \frac{9x^2}{32}\, dx = \left[\frac{9x^3}{96}\right]_{-2}^{2}$

$= \frac{9}{8}(2) - \frac{9}{8}(-2)$ $\qquad$ $= \frac{9(2)^3}{96} - \frac{9(-2)^3}{96}$

$= \frac{18}{8} + \frac{18}{8}$ $\qquad$ no FTC2 $\qquad$ $= \frac{9(8)}{96} - \frac{-9(8)}{96}$

$= \frac{36}{8} \rightarrow \boxed{4.5}$ $\qquad$ $= \frac{72}{96} + \frac{72}{96} = \boxed{1.5}$

4
$4.5 - 1.5 = 3$

$\boxed{V = 3}$

3 cubic units

5)

a) Base = 2 (from $x=-1$ to $x=1$)

Hieght = 2 (from $y=0$ to $y=2$)

Area = $\frac{1}{2}(2)(2) = 2$

Length = 2

Width = 2

Area = $(2)(2) = 4$

Total Area: $2+4=\boxed{6}$

Length of interval $L=4$, due to it being from ($x=-1$ to $x=4$)

Avearage = $\frac{6}{4}=\boxed{1.5}$

b) doesn't apply to the mean value theorm due to the fact it requires the function to be continous on the interval, and this function has a discontinuity at $x=0$.

the function is continuous at 0

6) a) $y = -\ln|\cos x|$

$1+\left(\frac{dy}{dx}\right)^2 = 1+\tan^2 x = \sec^2 x.$

$\frac{dy}{dx} = \frac{-1}{\cos x}(-\sin x)$

$\frac{dy}{dx} = \tan x$

Length of Curve: $\int_{0\pi}^{4\pi/3} \sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dx$

$\sqrt{\sec^2 x}$ $= -\sec x$ on this interval

$= \int_{\pi}^{\frac{4\pi}{3}} \sec x \, dx$

3

why? $= \left[\ln|\sec x + \tan x|\right]_{\pi}^{4\pi/3}$ no FTC2

$= \ln\left|\sec\frac{4\pi}{3} + \tan\frac{4\pi}{3}\right| - \ln|\sec\pi + \tan\pi|$

$= \ln(2-\sqrt{3})$

~~b)~~