$$V = \pi r^2 h$$
$$SA = 2\pi r h$$

7.3

25) ~~-x+y~~ ~~x+3y~~ $(1,0), (2,1), (1,1)$

ABOUT Y-AXIS

$(2,1)$

$(1,0)$

$$y = x-1$$

$$2\pi \int_1^2 x \left(x-1\right) dx = \frac{4\pi}{3}$$
$$1-(x-1)$$

$$2\pi \int_1^2 x \left(-x+2\right) dx$$

$$2\pi \int_1^2 x \left(1-(x-1)\right) dx = \frac{4\pi}{3}$$

x

$$y+1 = x$$

$$-\pi \int_0^1 (1)^2 dy$$

$$\pi \int_0^1 (y+1)^2 dy - \pi \int_0^1 (1)^2 dy$$

$$\pi \int_0^1 \left[(y+1)^2 - (1)^2\right] dy = \frac{4\pi}{3}$$
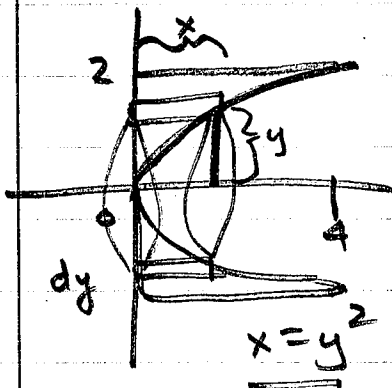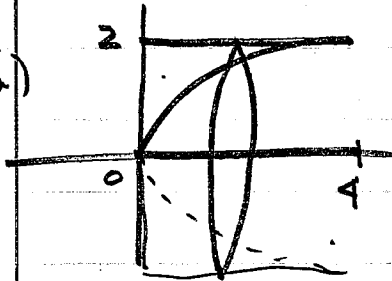
7.3

$$R^2 - r^2$$

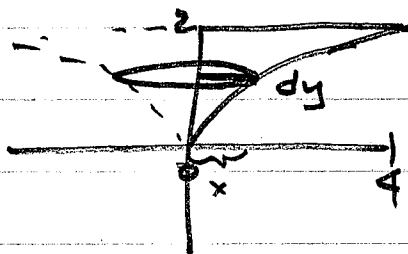29) $y = \sqrt{x}$, $y = 2$, $x = 0$ $\qquad \pi \int_0^4 (2)^2 \, dx - \pi \int_0^4 (\sqrt{x})^2 \, dx$

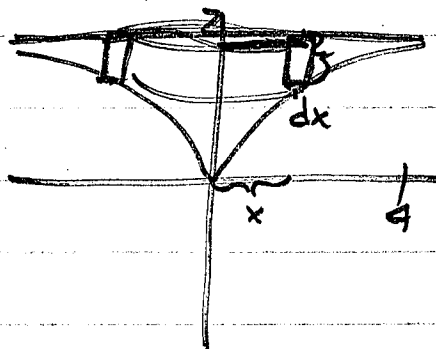$$\pi \int_0^4 \left[2^2 - (\sqrt{x})^2 \right] dx = 8\pi$$

(a)

$$2\pi \int_0^2 y \cdot y^2 \, dy = 8\pi$$
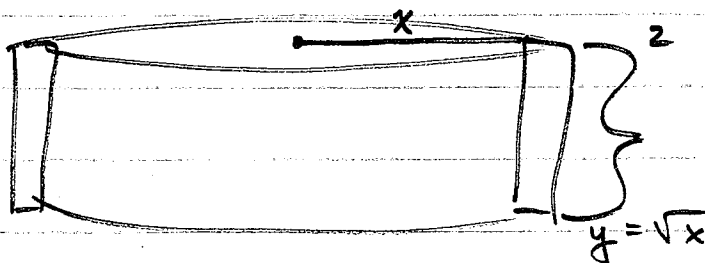

$$x = y^2$$

(b)

$$\pi \int_0^2 (y^2)^2 \, dy = \frac{32\pi}{5}$$

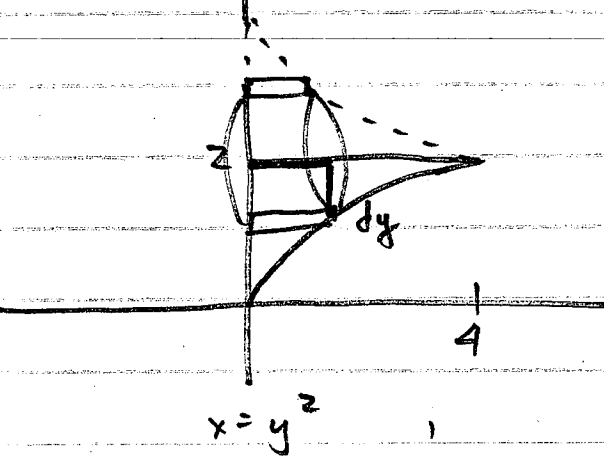$$2\pi \int_0^4 x (2 - \sqrt{x}) \, dx = \frac{32\pi}{5}$$

$$y = \sqrt{x}$$

7.3

29| (c)

$$\pi \int_0^4 (2-\sqrt{x})^2 \, dx = \frac{8\pi}{3}$$

2

dx $y=\sqrt{x}$

4

$$2\pi \int_0^2 (2-y) \, y^2 \, dy = \frac{8\pi}{3}$$

2

dy

4

$x = y^2$

(d)

2

dy

4
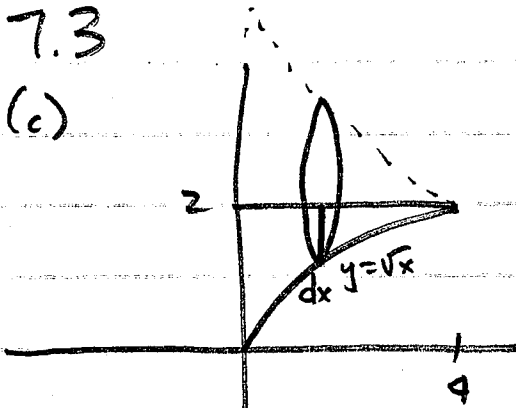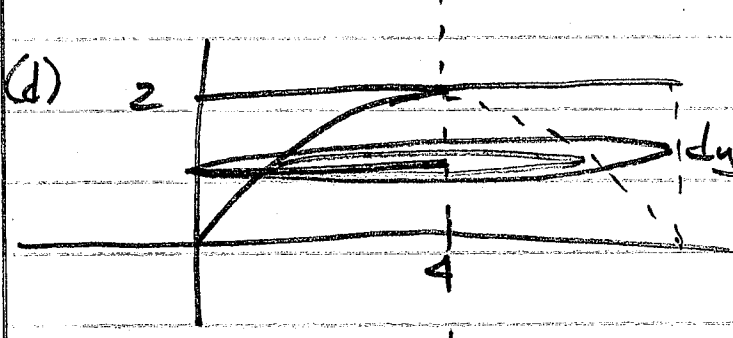
$$\pi \int_0^2 4^2 \, dy - \pi \int_0^2 (4-y^2)^2 \, dy$$

$$\pi \int_0^2 \left[4^2 - (4-y^2)^2 \right] \, dy$$
$$= \frac{224\pi}{15}$$

2

dx

4

$$2\pi \int_0^4 (4-x)(2-\sqrt{x}) \, dx$$
$$= \frac{224\pi}{15}$$

$2-y$
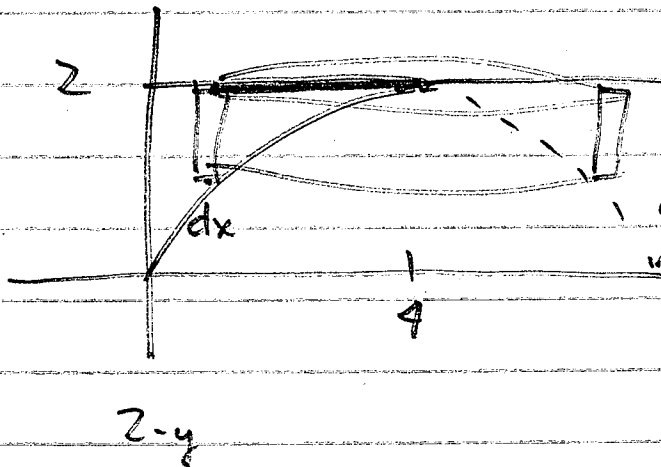
35) $y = x$, $y = -x/2$, $x = 2$ ABOUT y-AXIS (SHELL)
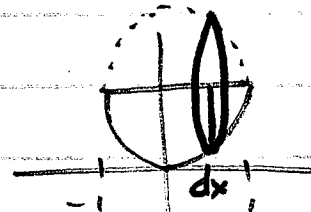
$y = x$

$y = -x/2$
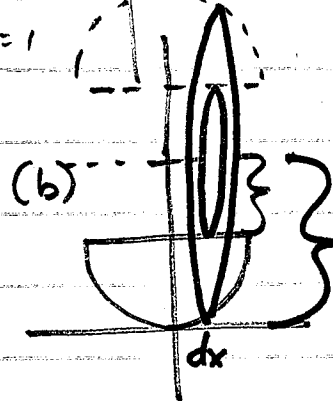
$x = 2$

dx

2
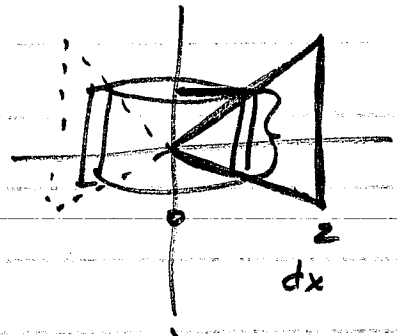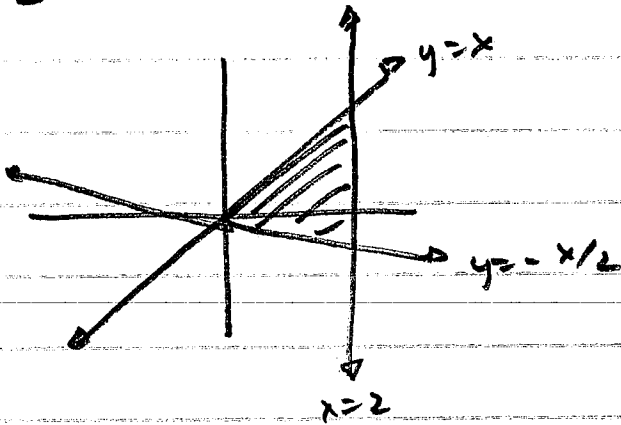
$$2\pi \int_0^2 x \left(x - \frac{-x}{2}\right) dx$$
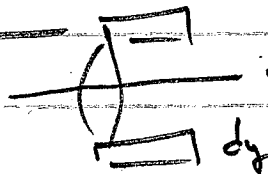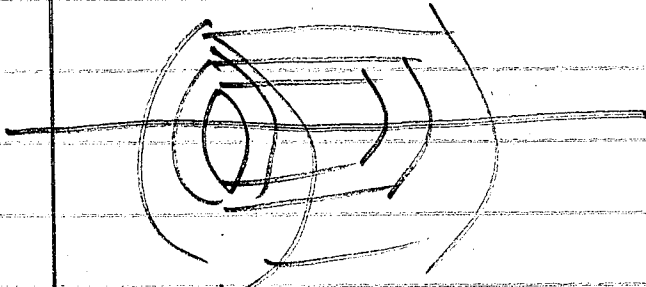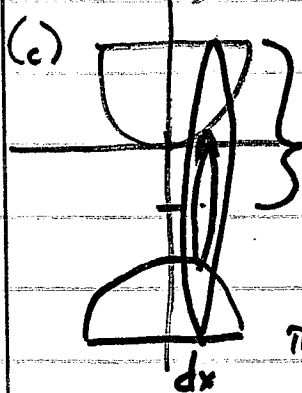
31) $y = x^2$, $y = 1$

(a)

$$\pi \int_{-1}^1 (1 - x^2)^2 dx$$

$y = 1$

dy

(b)

dx
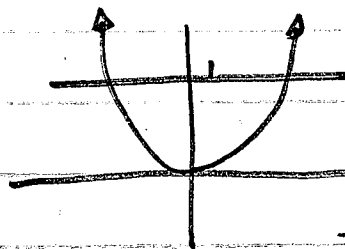
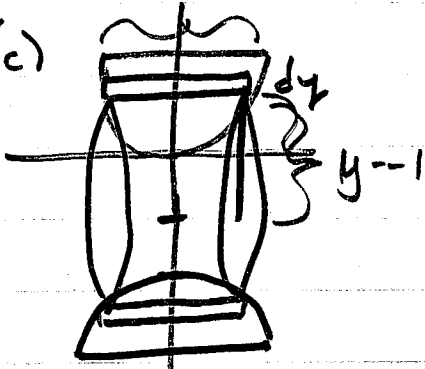$$\pi \int_{-1}^1 (2 - x^2)^2 dx - \pi \int_{-1}^1 (1)^2 dx$$

(c)

$R^2 - r^2$

$$\pi \int_{-1}^1 \left[(2 - x^2)^2 - (1)^2\right] dx$$

dx

$$\pi \int_{-1}^1 \left[(2)^2 - (x^2 - -1)^2\right] dx$$

SHELL METHOD

(c)

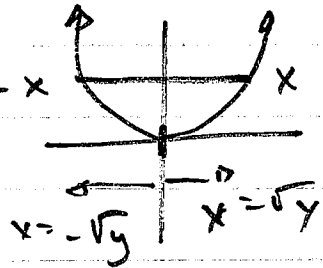$$2\pi \int_0^1 (y--1)(2\sqrt{y})dy$$

$$y = x^2$$

$$x = \pm\sqrt{y} \qquad x = \sqrt{y}$$

$$x = -\sqrt{y} \qquad x = \sqrt{y}$$

$$\sqrt{y} = -\sqrt{y}$$

45

(a)

WASHER

$$\pi \int_0^2 \left[(4x)^2 - (x^3)^2 \right] dx$$

$$y = 4x$$
$$\tfrac{1}{4}y = x$$

SHELL
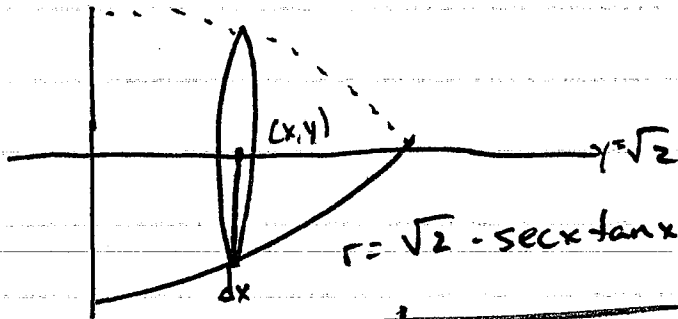

$$y = x^3$$
$$\sqrt[3]{y} = x$$
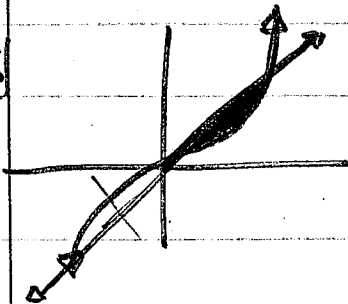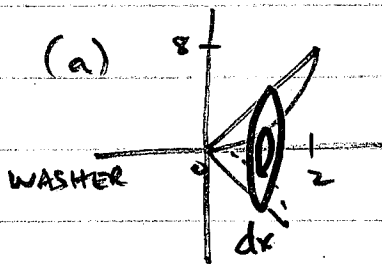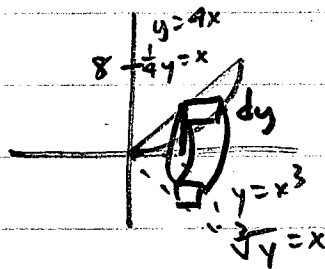
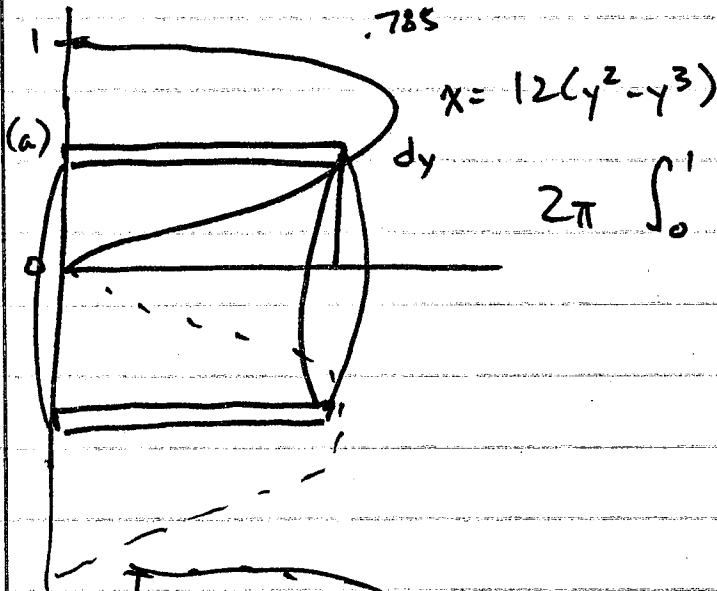$$2\pi \int_0^8 y\left(\sqrt[3]{y} - \tfrac{1}{4}y\right)dy$$

7.3

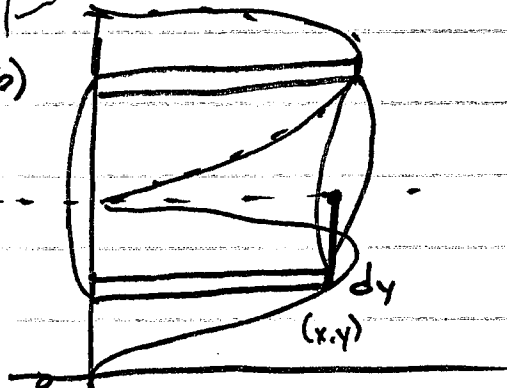21) $y = \sqrt{2}$, $y = \sec x \tan x$, y-axis   about $y = \sqrt{2}$

$$\int_0^{.785} \pi (\sqrt{2} - \sec x \tan x)^2 \, dx$$

$$\approx 2.301$$
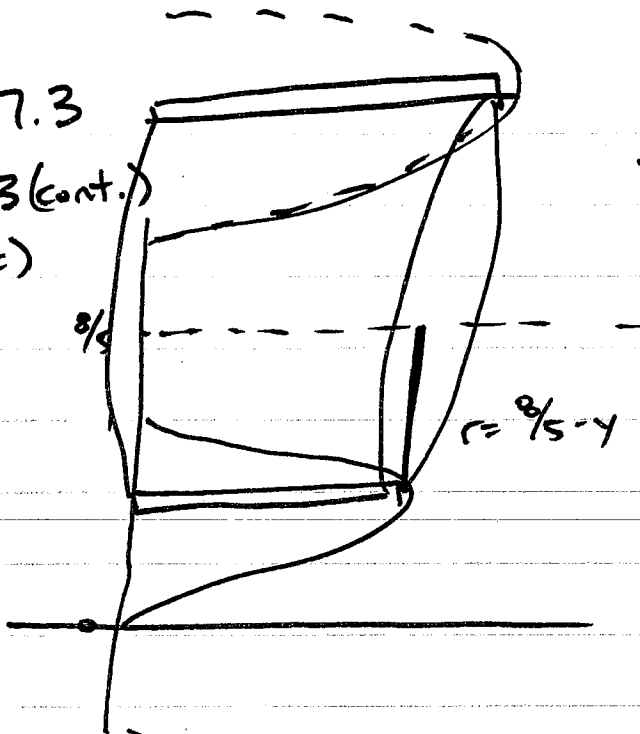
$r = \sqrt{2} - \sec x \tan x$

(x,y)

$y = \sqrt{2}$

dx

.785

33) (a)

$x = 12(y^2 - y^3)$

dy

$$2\pi \int_0^1 12\, y \, (y^2 - y^3) \, dy \approx 3.770$$

(b)

$$2\pi \int_0^1 12\, (1-y)(y^2 - y^3) \, dy$$

$$\approx 2.513$$

dy

(x,y)

7.3

33 (cont.)

(c)

$$2\pi \int_0^1 12\left(\tfrac{8}{5}-y\right)\left(y^2-y^3\right)dy$$

$$\approx 6.283$$

$\tfrac{8}{5}$

$r = \tfrac{8}{5} - y$

(d)

$$2\pi \int_0^1 12\left(y+\tfrac{2}{5}\right)\left(y^2-y^3\right)dy$$

$$\approx 6.283$$

dy

$r = y + \tfrac{2}{5}$

$-\tfrac{2}{5}$
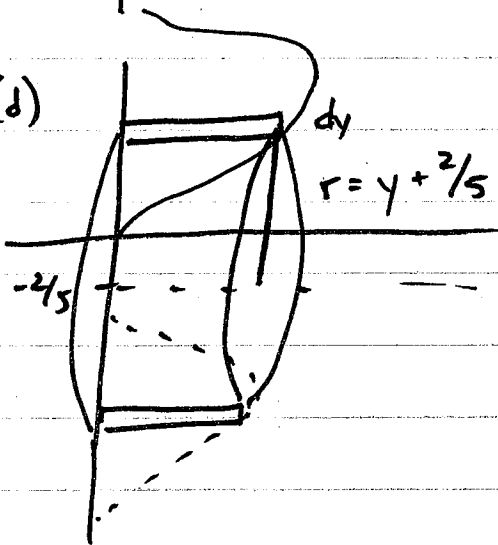
23) $x = \sqrt{5}\, y^2$, $x = 0$, $y = -1$, $y = 1$ about y-axis

(x,y)

$$2\pi \int_0^1 x\left(1-\sqrt{\tfrac{x}{\sqrt{5}}}\right)dx$$

$\times 2$

dx

$\sqrt{5}$

-1

$$\frac{x}{\sqrt{5}} = y^2$$

$$\pm\sqrt{\frac{x}{\sqrt{5}}} = y$$

7.3
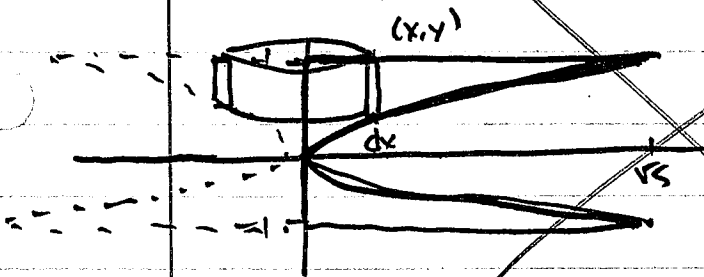
23]

$x = \sqrt{5}\, y^2$

$\int_{-1}^{1} \pi \left(\sqrt{5}\, y^2\right)^2 dx \approx 6.283$
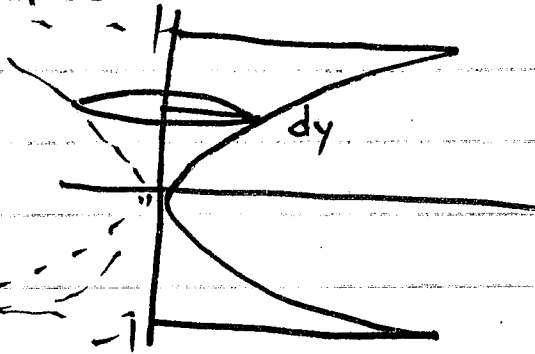
25]

$2\pi \int_{1}^{2} x \left(1 - (x-1)\right) dx \approx 4.189$
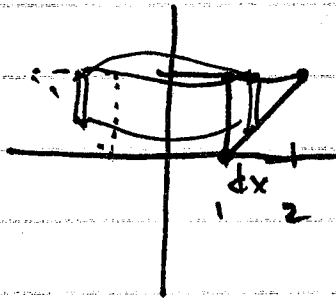
$(1,0), \; (2,1)$

$\dfrac{1-0}{2-1} = 1 \qquad b = -1$

$y = x - 1$

31] $y = x^2, \; y = 1$

(a) about $y = 1$

$\pi \int_{-1}^{1} \left(1 - x^2\right)^2 dx \approx 3.351$
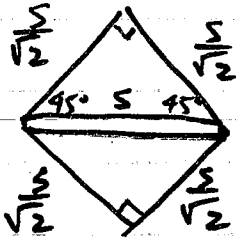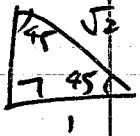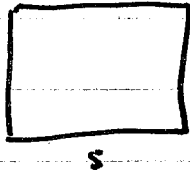

$r = 1 - x^2$

7.3
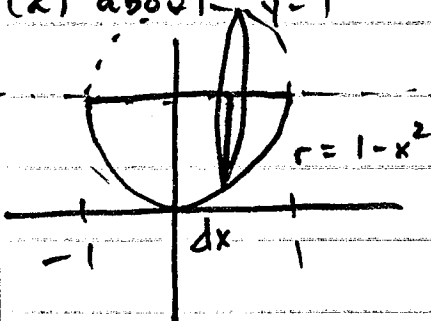
|c|
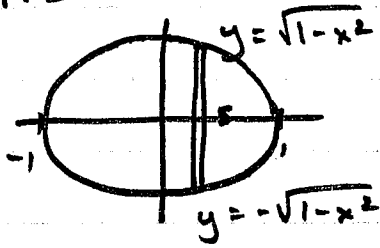
$$s = \sqrt{1-x^2} - -\sqrt{1-x^2}$$

$$s = 2\sqrt{1-x^2}$$

$$\int_{-1}^{1} \frac{(2\sqrt{1-x^2})^2}{2} dx \approx 2.667$$
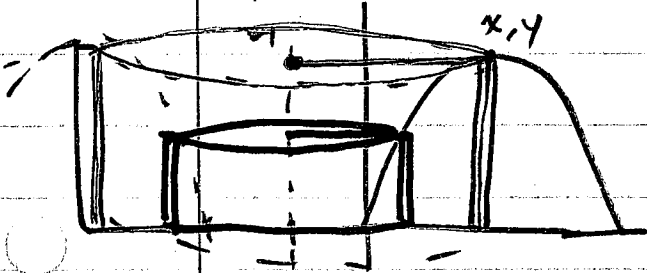
$$A = \frac{s}{\sqrt{2}} \cdot \frac{s}{\sqrt{2}} = \frac{s^2}{2}$$

$$A = s^2$$

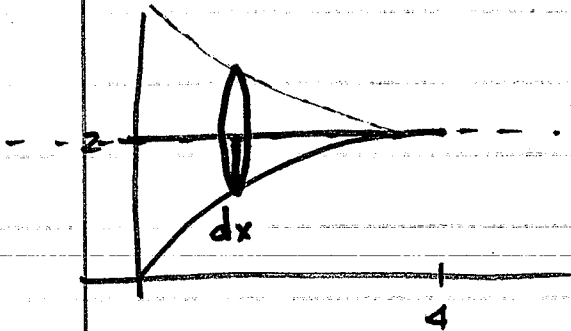## QQ #2   (pg 411)

2| $y = 3x - x^2$

$$\int_{0}^{3} 2\pi (x+1)(3x-x^2)dx \quad \textcircled{A}$$

7.3
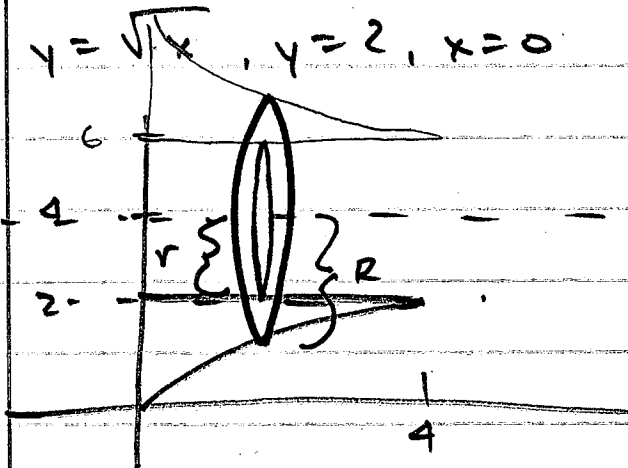
29c) $y = \sqrt{x}$, $y = 2$, $x = 0$ ABOUT $y = 2$

$$\pi \int_0^4 (2 - \sqrt{x})^2 \, dx \approx 8.378$$

WITH HOLE

$y = \sqrt{x}$, $y = 2$, $x = 0$ ABOUT $y = 4$

$$\pi \int_0^4 \left[(4 - \sqrt{x})^2 - (2)^2\right] dx$$

$$41.888$$