$x = \sqrt{y}$

1. Use $y = x^2, 0 \le x \le 3$

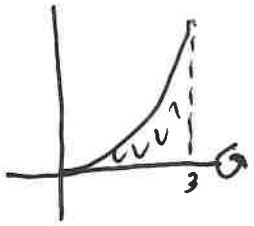
a. Write the integral that would find the volume of the rotated solid formed when the region bounded by the function and the x-axis is rotated about the x-axis.

b. Write the integral that would find the volume of the rotated solid formed when the region bounded by the function and the y-axis is rotated about the y-axis.

a.

Disk/Washer

$$\pi \int_0^3 (x^2)^2 \, dx$$



Shell

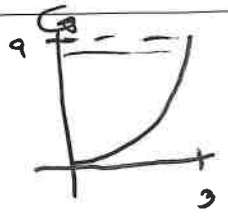
$$2\pi \int_0^9 y(3 - \sqrt{y}) \, dy$$

48.6π

b.

Disk/Washer

$$\pi \int_0^9 (\sqrt{y})^2 \, dy$$



Shell

$$2\pi \int_0^3 x(9 - x^2) \, dx$$

40.5π

2. Use $= x^2, 0 \le x \le 3$

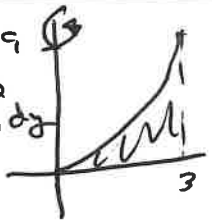
a. Write the integral that would find the volume of the rotated solid formed when the region bounded by the function and the x-axis is rotated about the y-axis.

b. Write the integral that would find the volume of the rotated solid formed when the region bounded by the function and the y-axis is rotated about the x-axis.

a.

Disk/Washer

$$\pi \int_0^9 (3)^2 \, dy - \pi \int_0^9 (\sqrt{y})^2 \, dy$$



Shell

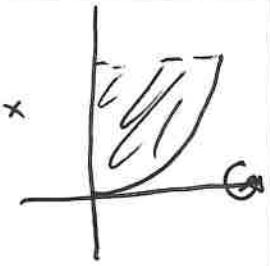
$$2\pi \int_0^3 x(x^2) \, dx$$

40.5π

b.

Disk/Washer

$$\pi \int_0^3 9^2 \, dx - \pi \int_0^3 (x^2)^2 \, dx$$



Shell

$$2\pi \int_0^9 y(\sqrt{y}) \, dy$$

194.4π

$x = \sqrt{y}$ $\quad\quad$ $x = \frac{y}{3}$

3. Use $y = x^2$ and $y = 3x$, $0 \le x \le 3$

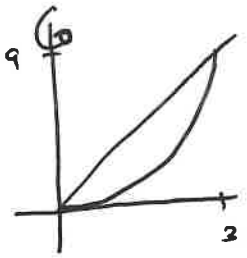
a. Write the integral that would find the volume of the rotated solid formed when the region bounded by the functions is rotated about the y-axis.

b. Write the integral that would find the volume of the rotated solid formed when the region bounded by the functions is rotated about the x-axis.

a.

Disk/Washer

$$= \pi \int_0^9 \sqrt{y}^2 \, dy - \pi \int_0^9 \left(\frac{y}{3}\right)^2 dy$$



Shell

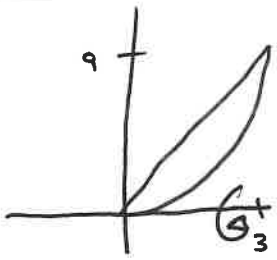
$$= 2\pi \int_0^3 x\,(3x - x^2)\,dx$$

13.5π

b.

Disk/Washer

$$= \pi \int_0^3 (3x)^2 \, dx - \pi \int_0^3 (x^2)^2 \, dx$$



Shell $2\pi \int_0^9 y\left(\sqrt{y} - \frac{y}{3}\right) dy$

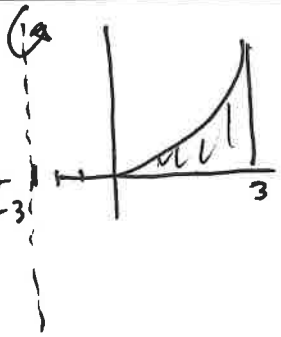
32.4π

4. Rotate $y = x^2$, $0 \le x \le 3$ and x-axis about lines a. $x = -3$ and then b. $x = 4$.

a.

Disk/Washer

$$\pi \int_0^9 (6)^2 \, dy - \pi \int_0^9 (3 + \sqrt{y})^2 \, dy$$



Shell

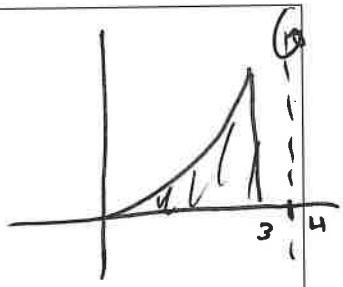
$$2\pi \int_0^3 (3 + x)\,x^2 \, dx$$

94.5π

b.

Disk/Washer

$$= \pi \int_0^9 (4 - \sqrt{y})^2 \, dy - \pi \int_0^9 1^2 \, dy$$



Shell

$$= 2\pi \int_0^3 (4 - x)\,x^2 \, dx$$

31.5π

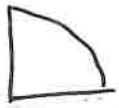
5. Write, but do not evaluate, an integral represented by the region formed by $y = x^2$, $0 \le x \le 3$ **and the** x **−axis** as the base of a solid where cross sections perpendicular to the x **−axis** are:

a. squares.

$$= \int_0^3 (x^2)^2 \, dx$$

b. quarter circles

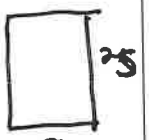
$$= \frac{\pi}{4} \int_0^3 (x^2)^2 \, dx$$



$A = \frac{\pi r^2}{4}$

c. rectangles where the height is twice the base.

$$= 2\int_0^3 (x^2)^2 \, dx$$



$2x^2$

d. equilateral triangles

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

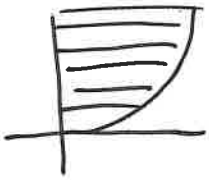
$\frac{x^2\sqrt{3}}{4}$

6. Write, but do not evaluate, an integral represented by the region formed by $y = x^2$, $0 \le x \le 3$ **and the** y **−axis** as the base of a solid where cross sections perpendicular to the y **−axis** are:

$x = \sqrt{y}$

a. squares.

$$\int_0^9 (\sqrt{y})^2 \, dy$$



b. semi-circles.

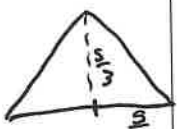
$$\frac{\pi}{8} \int_0^9 (\sqrt{y})^2 \, dy$$

$\pi \frac{1}{2}\left(\frac{d}{2}\right)^2$

$\pi \frac{1}{8} d^2$

c. isosceles triangles where the height is a third of the base length.

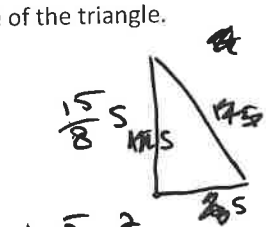
$$\frac{1}{6} \int_0^9 (\sqrt{y})^2 \, dy$$



$A = \frac{s^2}{6}$

d. right triangles with sides lengths of ratio 8:15:17 where the base of the triangle is the smallest side of the triangle.

$$= \frac{15}{816} \int_0^9 (\sqrt{y})^2 \, dy$$

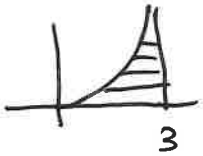


$\frac{1}{2}\frac{15}{8}s^2$

7. Write, but do not evaluate, an integral represented by the region formed by $y = x^2$, $0 \le x \le 3$ **and the** x **−axis** as the base of a solid where cross sections perpendicular to the y **−axis** are:

a. squares.

$$\int_0^9 (3 - \sqrt{y})^2 \, dy$$



b. quarter circles

$$\frac{\pi}{4} \int_0^9 (3 - \sqrt{y})^2 \, dy$$

$\frac{\pi r^2}{4}$