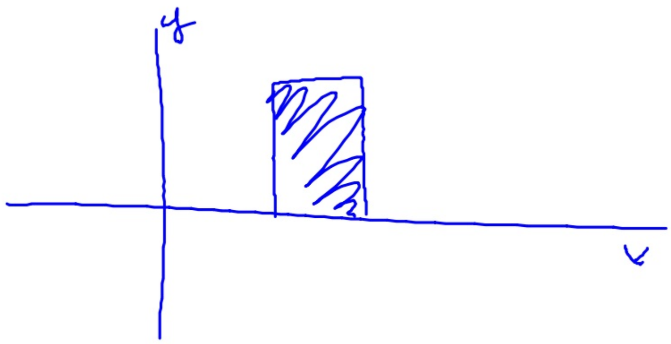
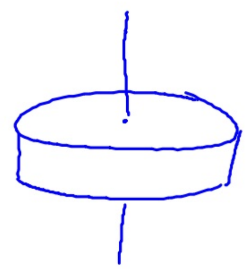
9.6 Volume of revolution

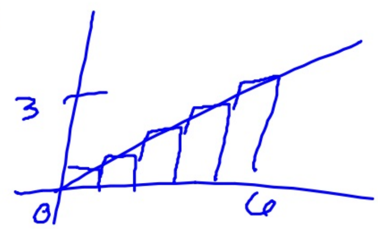
A solid of revolution is formed by ~~creating~~ rotating a plane figure about an axis of rotation.





Do Investigation p. 318

.5	1	$\pi(.5^2)(1)$
1	1	3.14
1.5	1	7.07
2	1	12.57 19.63
2.5		
3	1	28.27
		~~58.895~~ 71.465



(3) $V_{cylinder} = \pi r^2 h$

$$\int_0^6 \pi (0.5x)^2\,dx = \int_0^6 \pi\, .25\, x^2\,dx$$

$$= .25\pi\left[\frac{1}{3}x^3\right]_0^6 = 56.54 \text{ units}^3$$

(4) $V_{cone} = \frac{1}{3}\pi r^2 h$

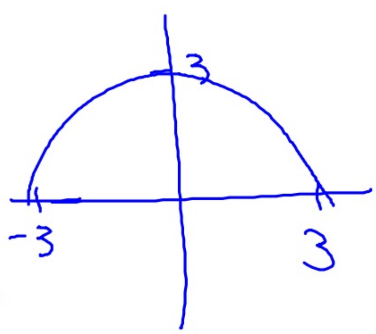
$= \frac{1}{3}\pi(3)^2(6)$

$= 56.54$

If y=f(x) is continuous on [a,b] and the region bounded by y=f(x) and the x-axis between xx=a and x=b is rotated 360 degrees about the x-axis, then the volume of the solid formed is given by:

$$\int_a^b \pi (f(x))^2 dx \quad \text{or} \quad \int_a^b \pi y^2 dx$$

$\boxed{\text{Ex}}$ Find the volume of a solid formed by $f(x)=\sqrt{9-x^2}$, rotated $360°$ about x-axis



$$\int_{-3}^{3} \pi \left(\sqrt{9-x^2}\right)^2 dx$$

$$= \pi \int_{-3}^{3} (9-x^2)\,dx = \pi\left[9x - \frac{1}{3}x^3\right]_{-3}^{3}$$

$$= \left[\pi 9x - \frac{\pi}{3}x^3\right]_{-3}^{3} \approx 113$$

check

$V_{sphere} = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(27) = 113$

HW 9m p. 319-320
#1-5