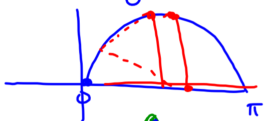
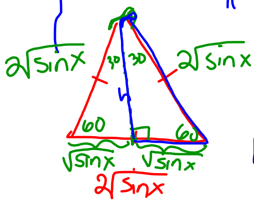
39. $y = 2\sqrt{\sin x}$



$V = \int_0^{\pi}$



$h^2 + \sqrt{\sin x}^2 = (2\sqrt{\sin x})^2$

$h^2 + \sin x = 4\sin x$

$\sqrt{h^2} = \sqrt{3\sin x}$

$h = \sqrt{3\sin x}$

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

$A = \frac{1}{2}(2\sqrt{\sin x})\sqrt{3\sin x}$

$A = \sqrt{3}\sin x$ $\quad V = \int_0^{\pi} \sqrt{3}\sin x\,dx$

$\sqrt{3}\int_0^{\pi} \sin x\,dx$

$\sqrt{3}(-\cos x)$

$-\sqrt{3}\cos x \Big|_0^{\pi}$

$(-\sqrt{3}\cos\pi) - (-\sqrt{3}\cos 0)$

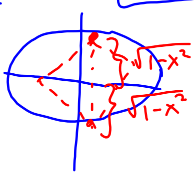
$-\sqrt{3}\cdot -1 \quad (-\sqrt{3}\cdot 1)$

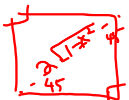
$\sqrt{3} + \sqrt{3}$

$\boxed{2\sqrt{3}u^3}$

1. c $y = -\sqrt{1-x^2}$

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





$\frac{2\sqrt{1-x^2}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$\frac{\cancel{2}\sqrt{2}\sqrt{1-x^2}}{\cancel{2}}$

$S = \sqrt{2}\sqrt{1-x^2}$ or $\sqrt{2-2x^2}$

$A = S^2$

$A = \sqrt{2-2x^2}^2$

$A = 2-2x^2$

$V = \int_{-1}^{1} 2-2x^2\,dx$

$2x - \frac{2x^3}{3}\Big|_{-1}^{1}$

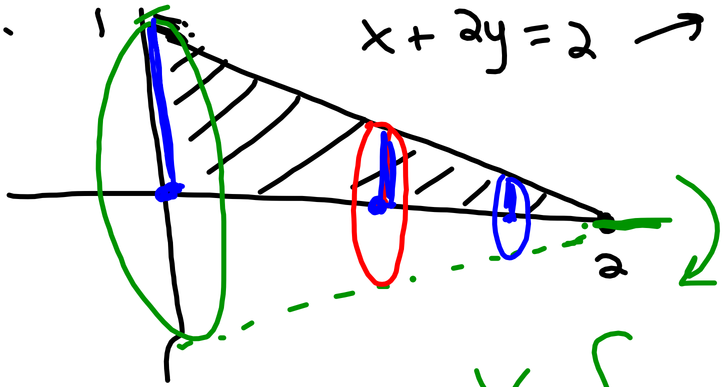
$\left(2-\frac{2}{3}\right) - \left(-2+\frac{2}{3}\right)$

$2-\frac{2}{3}+2-\frac{2}{3}$

$4-\frac{4}{3}$

$\frac{12}{3}-\frac{4}{3} = \boxed{\frac{8}{3}u^3}$

7.



$x + 2y = 2 \rightarrow 2y = -x + 2$

$y = \frac{-1}{2}x + 1$

$r = \frac{-1}{2}x + 1$

$A = \pi r^2$

$V = \int \text{area}$

$$V = \pi \int_0^2 \left(\frac{-1}{2}x + 1\right)^2 dx$$

$$\left(\frac{-1}{2}x + 1\right)\left(\frac{-1}{2}x + 1\right)$$

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

$$\pi \left[\frac{1}{12}x^3 - \frac{x^2}{2} + x \Big|_0^2 \right]$$

$$\pi \left[\left(\frac{8}{12} - \cancel{2} + \cancel{2}\right) - (0) \right]$$

$$\boxed{\frac{2}{3}\pi} \, u^3$$

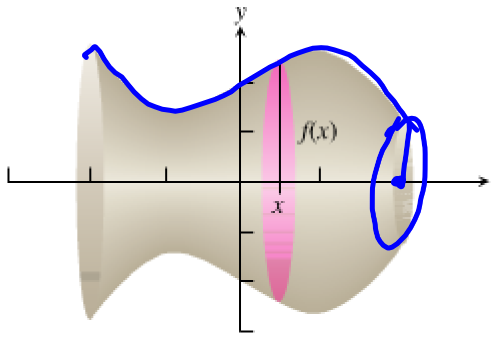
Circular Cross Sections

The only thing that changes when the cross sections of a solid are circular is the formula for $A(x)$. Many such solids are **solids of revolution,** as in the next example.

EXAMPLE 2 A Solid of Revolution

The region between the graph of $\boxed{f(x) = 2 + x\cos x}$ and the x-axis over the interval $[-2, 2]$ is revolved about the x-axis to generate a solid. Find the volume of the solid.

$r = 2 + x\cos x$



$$V = \pi \int_{-2}^{2} (2 + x\cos x)^2\, dx$$

NORMAL FLOAT AUTO REAL RADIAN MP

$\int_{-2}^{2}((2+X\cos(X))^2)dX$

16.68861868

NORMAL FLOAT AUTO REAL RADIAN MP

$\int_{-2}^{2}((2+X\cos(X))^2)dX$

16.68861868

Ans*π

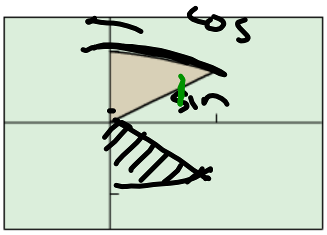
52.42884184

$16.689\pi \ u^3$

$52.429 \ u^3$

EXAMPLE 3 Washer Cross Sections

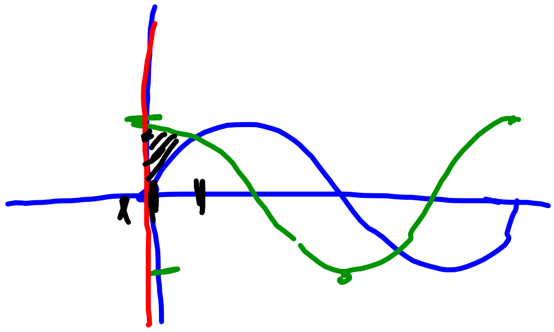
The region in the first quadrant enclosed by the y-axis and the graphs of $y = \cos x$ and $y = \sin x$ is revolved about the x-axis to form a solid. Find its volume.



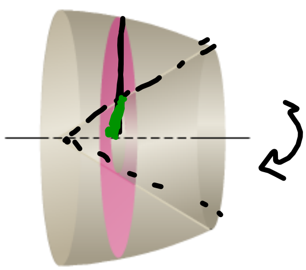
$[-\pi/4, \pi/2]$ by $[-1.5, 1.5]$

$R = \cos x$

$r = \sin x$



$$V = \pi \int_0^{\pi/4} \cos^2 x - \sin^2 x \, dx$$

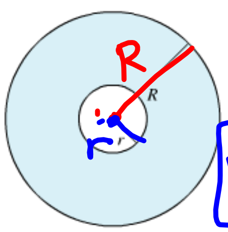


$$V = \pi \int_0^{\pi/4} \cos(2x) \, dx$$

$$V = \pi \left[\frac{\sin(2x)}{2} \Big|_0^{\pi/4} \right]$$

$$V = \pi \left[\left(\frac{\sin \pi/2}{2} \right) - \left(\frac{\sin 0}{2} \right) \right]$$

$$\boxed{\frac{1}{2}\pi \ u^3}$$



$A = \pi R^2 - \pi r^2$

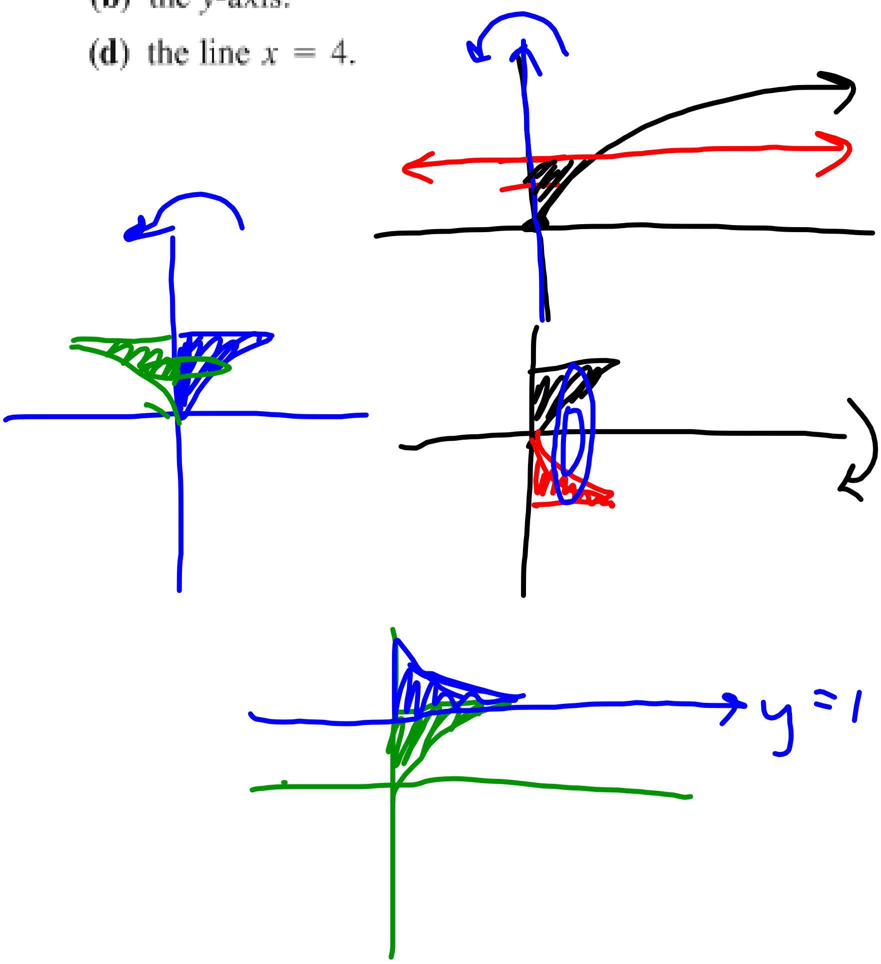
$\boxed{A = \pi(R^2 - r^2)}$

Figure 8.22 The area of a washer is $\pi R^2 - \pi r^2$. (Example 3)

29. Find the volume of the solid generated by revolving the region bounded by $y = \sqrt{x}$ and the lines $y = 2$ and $x = 0$ about

(a) the x-axis. **(b)** the y-axis.

(c) the line $y = 2$. **(d)** the line $x = 4$.



30. Find the volume of the solid generated by revolving the triangular region bounded by the lines $y = 2x$, $y = 0$, and $x = 1$ about

(a) the line $x = 1$. **(b)** the line $x = 2$.

31. Find the volume of the solid generated by revolving the region bounded by the parabola $y = x^2$ and the line $y = 1$ about

(a) the line $y = 1$.
(b) the line $y = 2$.
(c) the line $y = -1$.

Homework 8.3:
Day 1   1-7 odd,39 (cross sections)
Day 2   11,16,19,22(circles and washers)
Day 3   9,23,27,41(rotate around the y-axis)