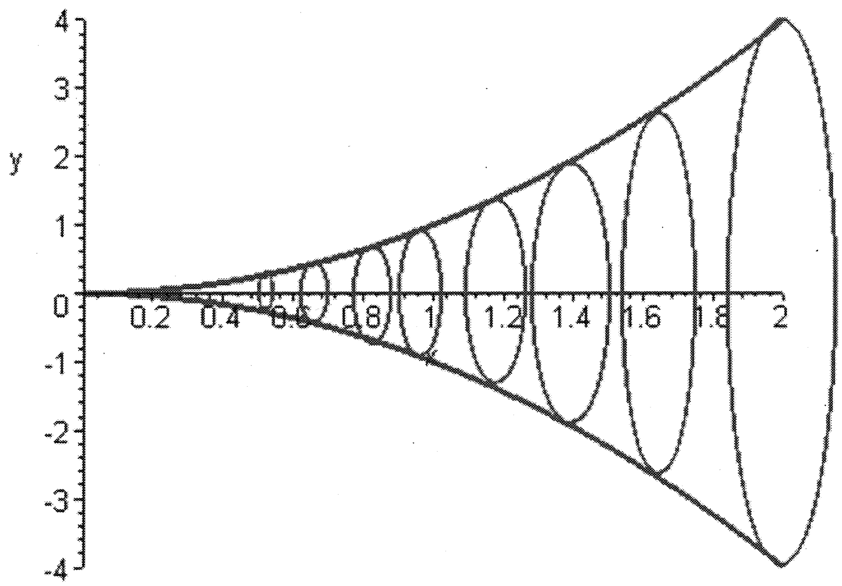
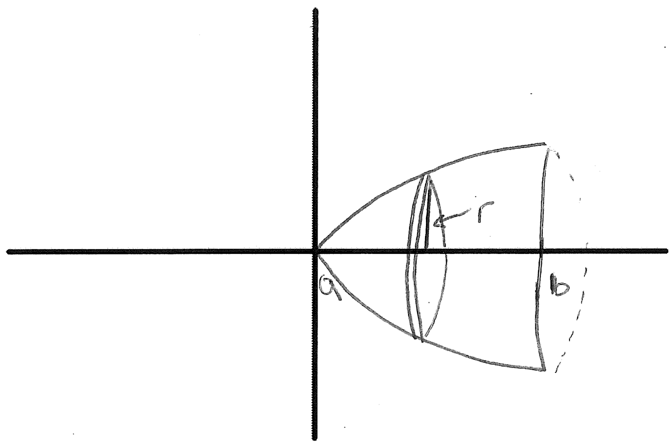
Volumes of Solids of Revolution
Disk/Washer Method



Disk Method

$f(x) = \sqrt{x}$

$x = a$ to $x = b$

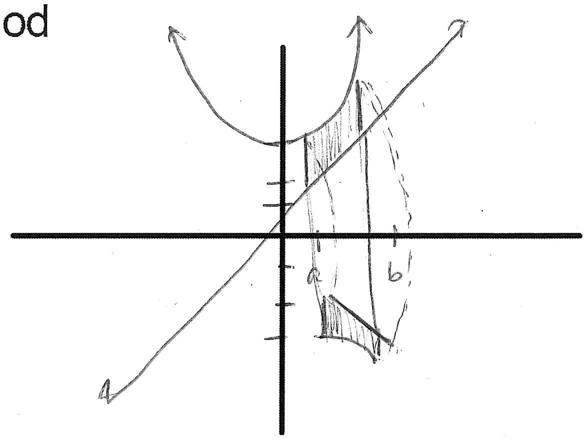


$A_{circle} = \pi r^2$

radius $= f(x) - 0$

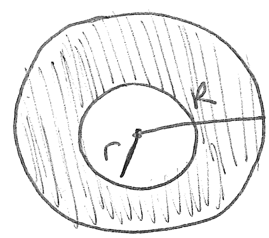
$$\int_a^b \pi r^2 \, dx \rightarrow \pi \int_a^b (f(x))^2 \, dx$$

Washer Method



$f(x) = x^2 + 3$

$g(x) = x$



R - outter radius

r - inner radius

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

Volume $= \int_a^b \pi R^2 - \pi r^2 \, dx$

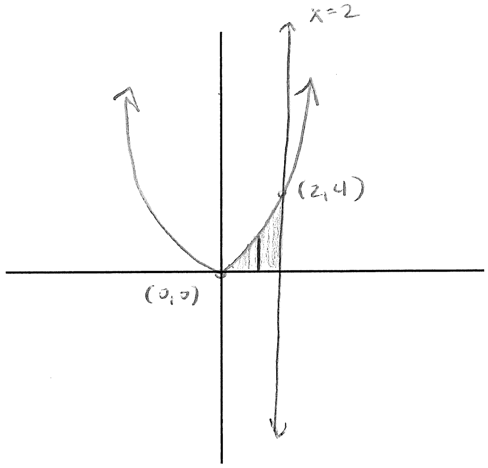
$\pi \int_a^b R^2 - r^2 \, dx$

AP Calculus AB
Disks & Washers Worksheet #1

Name Key

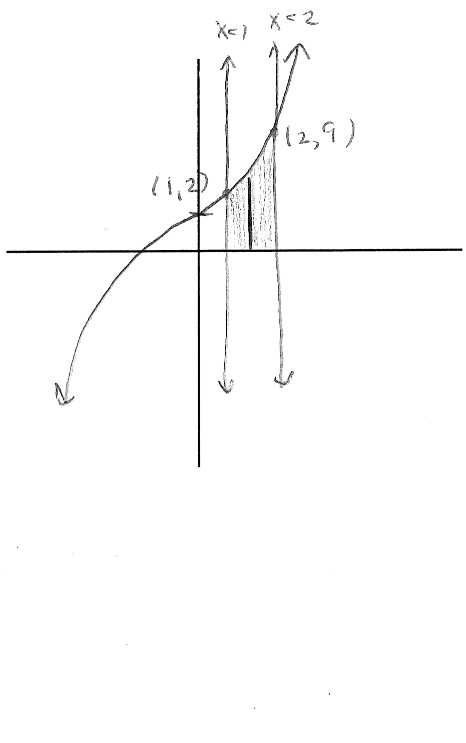
etch the graphs, shade the bounded region, set up the integral, and find the volume.

1. $y = x^2$, x = 0, y = 0, and x = 2 rotated about the x-axis



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

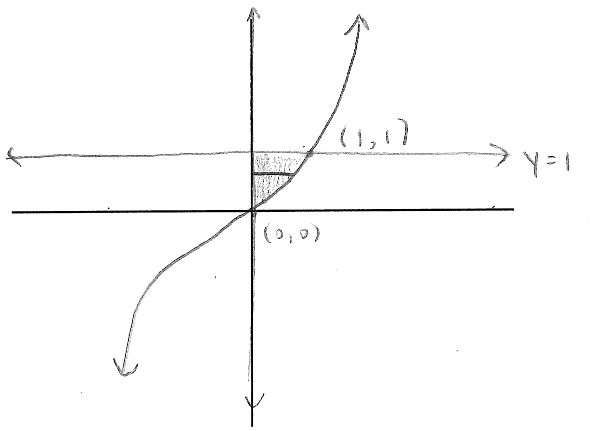
$y = 1 + x^3$, y = 0, x = 1, and x = 2 rotated about the x-axis



$$\pi \int_1^2 (1+x^3)^2 \, dx$$

3. $y = x^3$, y = 1, and x = 0 rotated about the y-axis

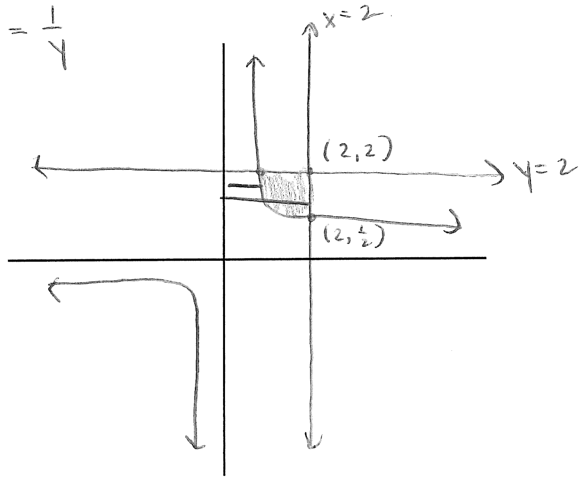
$x = \sqrt[3]{y}$



$$\pi \int_0^1 (\sqrt[3]{y})^2 \, dy$$

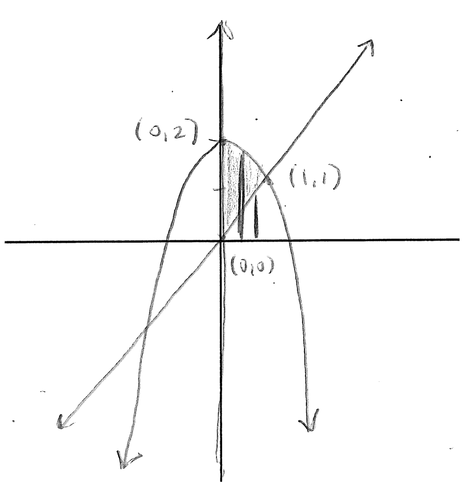
4. $y = \frac{1}{x}$, y = 2, and x = 2 about the y-axis

$x = \frac{1}{y}$



$$\pi \int_{\frac{1}{2}}^{2} (2)^2 - \left(\frac{1}{y}\right)^2 dy$$

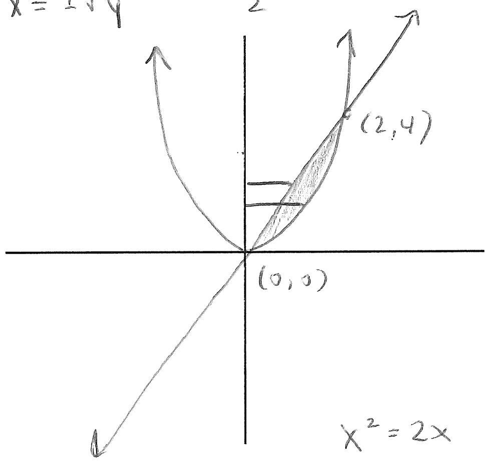
5. $y = x$, $y = 2 - x^2$, and x = 0 rotated about the x-axis



$$\pi \int_0^1 (2-x^2)^2 - (x)^2 \, dx$$

6. $y = x^2$, and $y = 2x$ rotated about the y-axis

$x = \pm\sqrt{y}$ $\quad x = \frac{y}{2}$



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

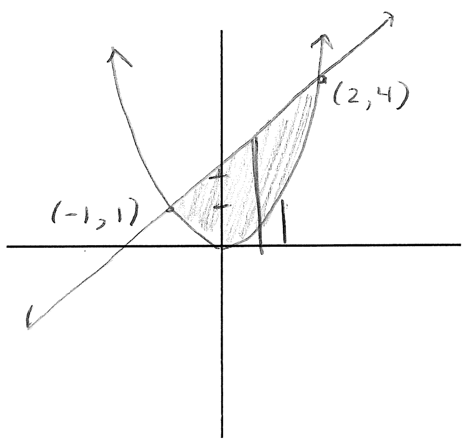
$x^2 = 2x$

$x^2 - 2x = 0$

$x(x-2) = 0$

$x = 0 \quad x = 2$

7. $y = x^2$, and $y = x + 2$ rotated about the x-axis



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

$x^2 = x + 2$

$x^2 - x - 2 = 0$

$(x-2)(x+1) = 0$

$x = 2 \quad x = -1$