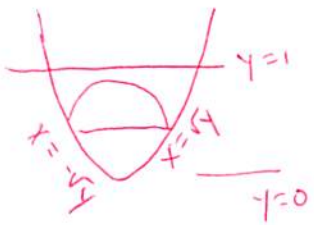
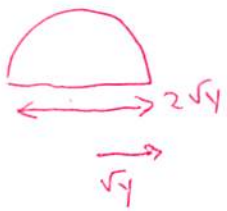
7. [5] Let R be the region bounded by $y = x^2$ and $y = 1$. Construct a solid with R for its base where each horizontal line segment ($y = c$) going across R is the diameter of a semicircle that is perpendicular to the xy-plane. Write an integral that expresses the volume of the solid. DO NOT EVALUATE THE INTEGRAL.





Area of semicircle
$= \frac{1}{2}\pi(\sqrt{y})^2 = \frac{1}{2}\pi y$

$V = \int_0^1 \frac{1}{2}\pi y \, dy$

6.3.9

8. [4] Write an integral that expresses the length of the curve $y = 1/x$ for $2 \le x \le 4$. DO NOT EVALUATE THE INTEGRALS.

$f(x) = x^{-1}$

$f'(x) = -x^{-2}$

$(f')^2 = x^{-4}$

$1 + (f')^2 = 1 + x^{-4}$

(6.5.17)

$\int_2^4 \sqrt{1 + x^{-4}}\, dx$

9. [8] Find the value of a where the length of $y = \frac{4}{3}x^{3/2}$ from $x = 0$ to $x = a$ is 7/6.

$y = \frac{4}{3}x^{3/2}$

$y' = 2x^{1/2}$

$1 + (y')^2 = 1 + 4x$

$\frac{7}{6} = \int_0^a \sqrt{1 + 4x}\, dx$

$u = 1 + 4x$

$du = 4\,dx$

$\frac{1}{4}\,du = dx$

(6.5.5)

$= \frac{1}{4}\int_1^{1+4a} u^{1/2}\, du$

$= \frac{1}{4}\cdot\frac{2}{3}u^{3/2}\Big|_1^{1+4a}$

$= \frac{1}{6}\left[(1+4a)^{3/2} - 1\right] = \frac{7}{6}$

$(1+4a)^{3/2} - 1 = 7$

$(1+4a)^{3/2} = 8$

$1 + 4a = 4$

$4a = 3 \quad a = \boxed{3/4}$