Section 7.1

Area Between Two Curves: If f and g are continuous on $[a, b]$ and $g(x) \leq f(x)$ for all x in $[a, b]$, then the area of the region bounded by the graphs of f and g and the vertical lines $x = a$ and $x = b$ is

$$A = \int_a^b [f(x) - g(x)]\, dx.$$

Representative Rectangle: An important concept that is used to help visualize a particular area or volume. It is very useful in determining the appropriate setup for a given formula. Representative rectangles can be either vertical (integrate with respect to x) or horizontal (integrate with respect to y).

Area Between Intersecting Graphs: First find the x-coordinates of the intersection points of the two graphs, then use these values as a and b for the formula for the area between two curves. The larger of two functions on a given interval will be f. More than one integral may be necessary if the graphs intersect more than twice.

1) Find the area of the region bounded by the graphs of $y = 2 - x^2$ and $y = x^2$ between $x = 0$ and $x = 1$.

2) Find the area of the region bounded by the graphs of $f(x) = x^2 - 1$ and $g(x) = 2 - 2x$.

3) If you graph the functions $f(x) = \sin x$ and $g(x) = \sin 2x$, you will see that there are two regions of different sizes enclosed by the graphs (they are repeated infinitely often).

   a) Find the area enclosed by the smaller region.

   b) Find the area enclosed by the larger region.

4) Find the area of the region between the graphs of $f(x) = -2x^3 + 9x^2 - 10x + 3$ and $g(x) = x^2 - 4x + 3$.

5) Find the area of the region bounded by the graphs of $x = y^2 - 1$ and $x = 1 - y$.

Homework for 7.1: #3, 6, 12, 15, 20, 23, 25, 33, 38, 49