**The Area of a Region Bounded by Two Graphs**

**Def:** If $f$ and $g$ are continuous on $[a, b]$ and $g(x) \leq f(x)$ for all $x$ in the interval, then the area of the region bounded by the graphs of $f$, $g$, $x = a$, and $x = b$ is given by . . .

**Ex 1:** Find the area of the region bounded by the graphs of $y = -x^2 + 2x + 1$ and $y = 2x^2 - 4x + 6$ for $1 \leq x \leq 2$. 
Warning!!

**Ex 2:** Find the area of the region bounded by the graphs of \( y = 3x - x^2 \) and 
\( y = 2x^3 - x^2 - 5x \) for \(-2 \leq x \leq 2\).
Ex 3: Set up definite integral(s) that compute the area of the regions below:

(a) Between the graphs of \( y = x^2 \) and \( y = (x-2)^2 \) for \( 0 \leq x \leq 3 \). **Do not evaluate the integral.**

**WHO IS ON TOP WHEN?!** In order to algebraically determine where one function switches from top to bottom, solve \( f(x) = g(x) \) for \( x \). (Your calculator can also help).

(b) The area of the region between the graphs of \( y = x^2 + 2x + 3 \) and \( y = 2x + 4 \).

(c) The area of the region between the graphs of \( y = 2x^3 \) and \( y = x^3 + 3x \).
SWITCHING ROLES OF THE VARIABLES

Def: If $x = g(y)$ and $x = h(y)$ are continuous on $[c, d]$ and $g(y) \leq h(y)$ for all $y$ in the interval, then the area of the region bounded by the graphs of $g$, $h$, $y = c$, and $y = d$ is given by . . .

Ex 4: Set up a definite integral in the variable $y$ that computes the area of the region bounded by $y = x$, $y = (x - 2)^2$, and $y = 0$ as pictured below:

Set up a definite integral(s) in the variable $x$ that computes the area of the same region.
MATH 141 HW QUIZ 1

Directions: Show ALL work for full credit. Please use the back if you need more room.

1. [5pts] Do 7.1 # 18

2. [5pts] Do 7.1 # 30