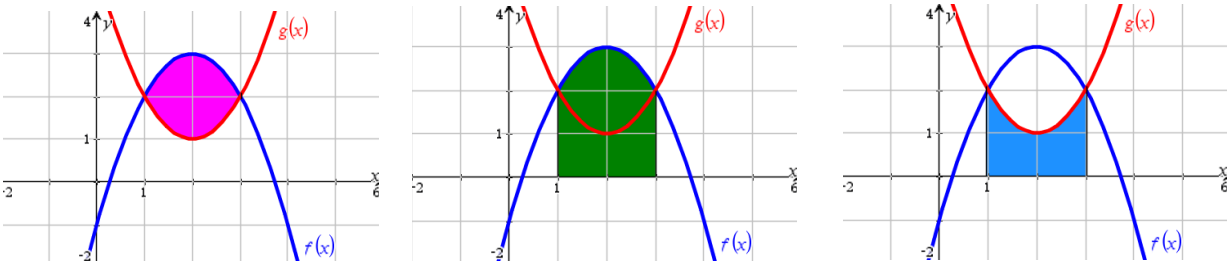
CHA		
4	Topic: 8.4	Finding Areas Between Curves Expressed as Functions of *x*
Learning Objective CHA-5.A: Calculate areas in the plane using the definite integral.		

With a slight modification, we can change the concept of finding the area of a region under a curve (that lies above the *x*-axis) to finding the area of a region between two curves.

Consider the following graphs of $y = f(x)$ and $y = g(x)$ that are continuous on the interval $[2,4]$.



Area of region between *f* and *g*	=	Area of region under *f*		Area of region under *g*
$\int_1^3 [f(x) - g(x)]\,dx$	=	$\int_1^3 f(x)\,dx$	−	$\int_1^3 g(x)\,dx$

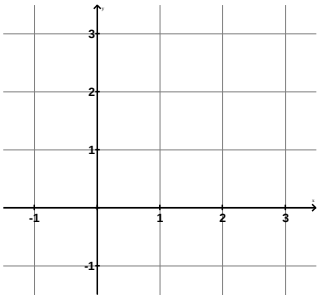
Area of a Region Between Two Curves

If *f* and *g* are continuous on [*a*, *b*] and $g(x) \le f(x)$ 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

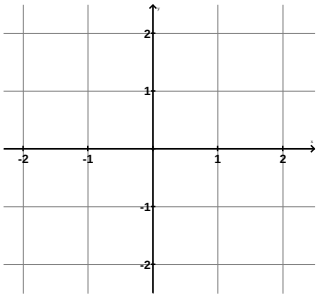
$$A = \int_a^b [f(x) - g(x)]\,dx$$

Example 1: Finding the Area of a Region Between Curves.

Find the area of the region bounded by the graphs of $y = x^2 + 2, y = -x, x = 0$ and $x = 1$. Sketch the graph and shade the region.

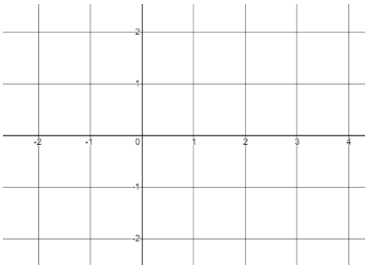


Example 2: **A Region Lying Between Two Intersecting Graphs**.
Find the area of the region bounded by the graphs of $f(x) = 2 - x^2$and $g(x) = x$. Sketch the graph and shade the region.

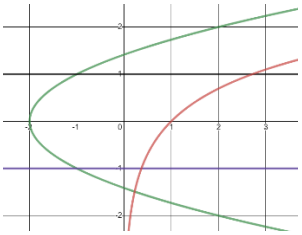


CHA		
4	Topic: 8.5	Finding Areas Between Curves Expressed as Functions of y
Learning Objective CHA-5.A: Calculate areas in the plane using the definite integral.		

Example 3: **Horizontal Representative Rectangles.**
Find the area of the region bounded by the graphs of $x = 3 - y^2$ and $x = y + 1$. Sketch the graph and shade the region.



Example 4: Find the area bound by the curves $x = y^2 - 2, y = -1, y = 1,$ and $x = e^y$ as shown in the graph. Shade the region that is bounded by those given equations.



CHA		
2	Topic: 8.6	Finding Areas Between Curves that Intersect at More than Two Points
Learning Objective CHA-5.A: Calculate areas in the plane using the definite integral.		

Example 5: Curves That Intersect at More Than Two Points.
Find the area of the regions bounded by the graphs of $f(x) = 3x^3 - x^2 - 10x$ and $g(x) = -x^2 + 2x$.
Sketch the graph and shade the region.