Recall:
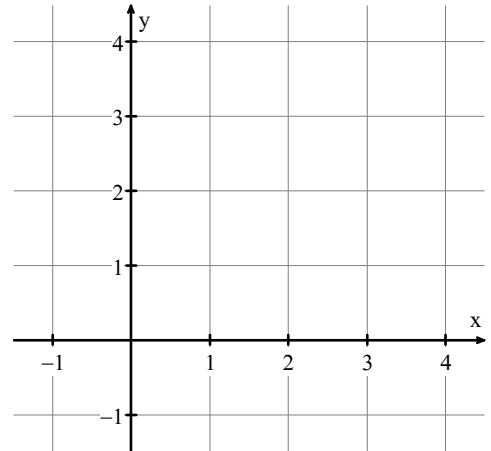- Find the area under the curve of $f(x)$

How would you find the area between two curves?

Area Between Two Curves:

$$A = \int_a^b [\qquad\qquad] \, dx$$

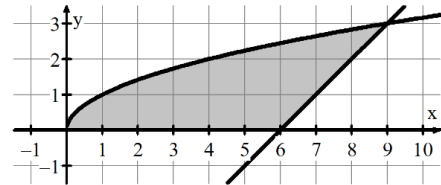$$\geq \qquad \text{for all } x \text{ in } [a,b]$$

1. Find the area bounded by the curves of $y = x^2 + 2$, $y = -x$, $x = 0$, and $x = 1$.
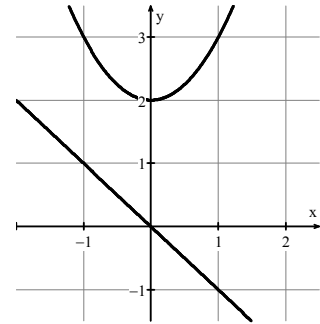
2. Find the area bounded by $y = 2 - x^2$ and $y = x$.

3. Set up the integral that allows you to find the area in the first quadrant that is bounded above by $y = \sqrt{x}$ and below by $y = x - 6$.
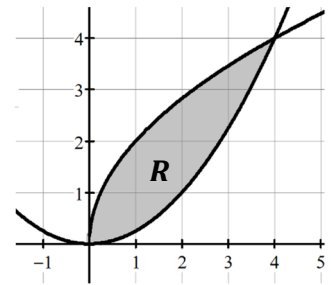
Be careful of a rounding error.

4. Find the area bounded by the curves $y = \ln x$ and $y = \frac{1}{2}x - 2$.

5. Let R be the region bounded by the graphs $y = 2\sqrt{x}$ and $y = \frac{x^2}{4}$ as shown in the figure. If the line $x = k$ divides R into two regions of equal area, what is the value of k?
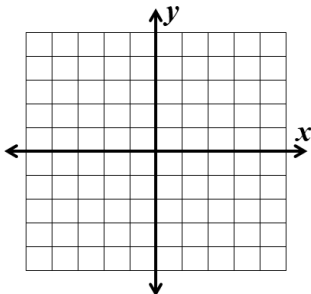

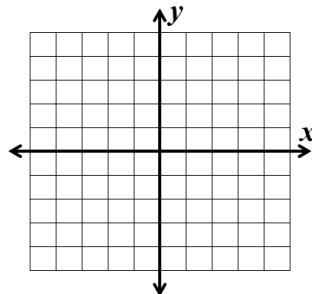## 8.4 Area Between Curves (with respect to x)
Calculus

Practice

Sketch **the graph of each equation, then set up the integral to find the area of the region bounded by the graphs. Do NOT evaluate, just set up the integral!**

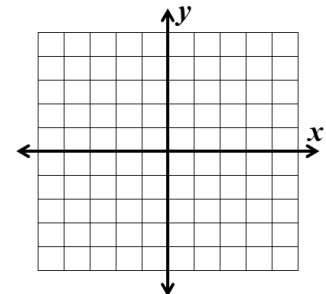| 1. $f(x) = x^2 + 2$, $g(x) = -x$, $x = -2$, and $x = 1$.	2. $f(x) = 6 - x^2$ and $g(x) = x$	3. $y = x$, $y = 2 - x$, $y = 0$

Find the area of the region bounded by the following graphs. Show your work.
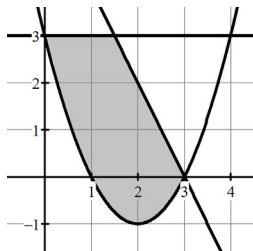
4. $y = \frac{1}{x^2}$, $y = 0$, $x = 1$, $x = 5$

5. $y = x^2$ and $y = x^3$

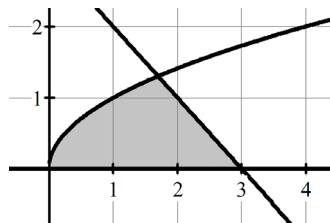6. $y = \sqrt{x}$, $x = 0$ and $y = x - 2$

7. **Calculator active.** $y = e^{x^2} - 2$ and $y = \sqrt{4 - x^2}$

Set up an integral(s) that represents the shaded region. Do not solve. Use a calculator if necessary to help find the lower and upper bounds.
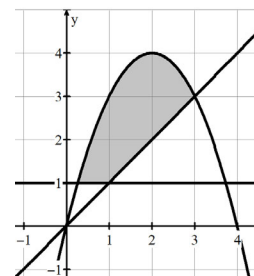
8. $y = x^2 - 4x + 3$, $y = 3$, and $y = 6 - 2x$
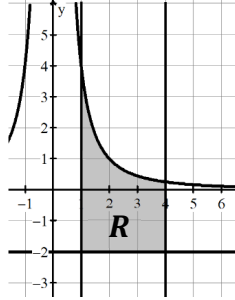

9. $y = \sqrt{x}$, $y = 0$, and $y = 3 - x$

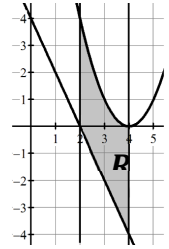10. $y = 4x - x^2$, $y = 1$, and $y = x$

Let R be the region bounded by the given curves as shown in the figure. If the line $x = k$ divides R into two regions of equal area, find the value of k
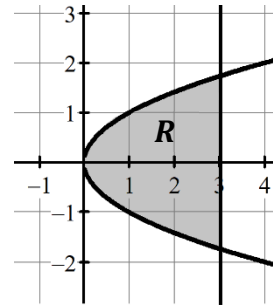
11. $y = \dfrac{4}{x^2}$, $y = -2$, $x = 1$, and $x = 4$

12. $y = x^2 - 8x + 16$, $y = -2x + 4$, $x = 2$, and $x = 4$

13. $y = \sqrt{x}$, $y = -\sqrt{x}$, and $x = 3$

8.4 Area Between Curves (with respect to x)

Test Prep

14. **Calculator active problem.** If $0 \le k \le \dfrac{\pi}{4}$ and the area under the curve $y = \sin x$ from $x = k$ to $x = \dfrac{\pi}{4}$ is 0.2, then what is the value of k?

15. **Calculator active problem.** The shared region in the figure above is bounded by the graph $y = \sqrt{2 + x - x^2}$ and the lines $x = -3$, $x = 3$, and $y = 2$. What is the area of this region?