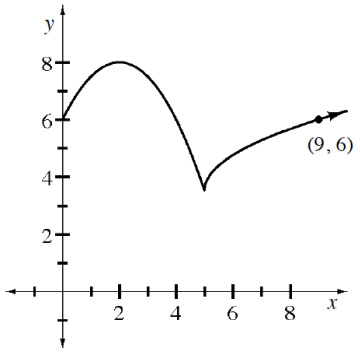
Homework #13

First & Last Name: _____ **Class:** _____

For homework to be graded, it must be *fully completed*. This means you must **show your work**.

1. **[Challenge]** Write a piecewise-defined function that will generate the graph below.



2. State the domain of each of the following functions.

a. $f(x) = \sqrt{25 - x^2}$

b. **[Challenge]** $g(x) = \log(x + 5)$

c. $h(x) = \frac{5x}{x^2 - x - 12}$

d. $k(x) = \frac{\sqrt{x+2}}{x^2 - 4}$

3. Simplify:

$$\left(\left(\frac{x^{-1} + x^2}{x}\right) - x + x^{-2}\right)^{-2}$$

4. **[Challenge]** Calculus problems often require using one or more of the trigonometric identities to solve problems. Solve each of the following equations on the interval $[0,\ 2\pi)$. Use exact values.

a. $\tan(x) \cdot \csc(x) = 2$

b. $\sin(x) \cdot \cos(x) = \frac{1}{4}$

c. $2\sin^2(x) - \cos(x) - 1 = 0$

d. $\tan(x) + \cot(x) = -2$

5. For each part below, give an example of a function with specified attributes. Provide a sketch of each function.

a. A function with a hole at $x = 3$ and an asymptote at $x = -1$.

b. A function with asymptotes at the y-axis and $x = 5$ and a hole at $x = -4$.

c. A function with an end-behavior function $g(x) = 3x - 1$.

6. **[Challenge]** Some of the basic functions have special qualities that you have investigated in this chapter. Desmos (desmos.com/calculator/yvn29ale4f).

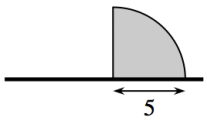
a. Sketch $y = \sin(x)$ on your paper. Darken in the largest portion of the graph containing $x = 0$ for which the function passes both the horizontal and vertical line tests. State the restricted domain and range for this portion of the graph.

b. We use the darkened portion of the graph to sketch $y = \sin^{-1}(x)$, making sure it is a function. Then state the domain and range.

c. Repeat parts (a) and (b) for $y = \cos(x)$.

7. A function g is even. What can you conclude about the inverse of g? Explain.

8. A flag in the shape of a quarter-circle is shown below.

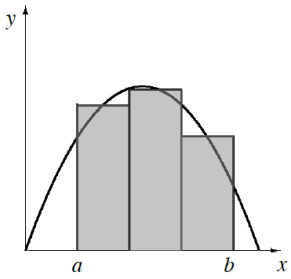


a. Imagine rotating the flag about its pole and describe the resulting three-dimensional figure. Draw a picture of this figure on your paper. Try this using Desmos (desmos.com/calculator/ulng7lkkdd).

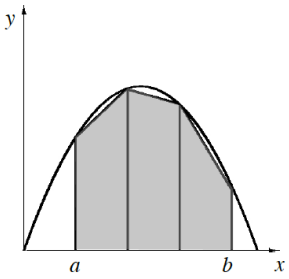
b. Calculate the volume of the rotated flag.

9. Which is Better? Part Two

Below is a comparison between using rectangles and trapezoids to approximate the area under a curve for the same interval of a function. Decide which method you think will best approximate the area under the curve for $a \le x \le b$. Then approximate the area using each method if $f(x) = -0.25\,x(x - 9)$, $a = 2$, and $b = 8$ using 3 sections. Compare your results with the actual area $A = 25.5$ un^2.



Midpoint Rectangles



Trapezoids