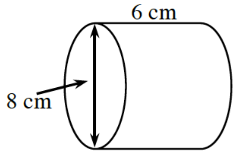
Homework #3

First & Last Name: ____ **Class:** ______

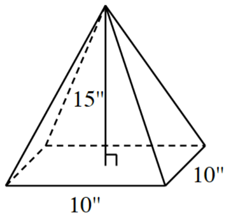
For homework to be graded, it must be *fully completed*. This means you must **show your work**.

1. Calculate the volume of each of the following solids.

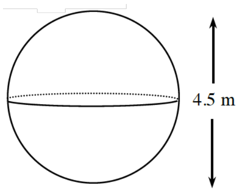
a.



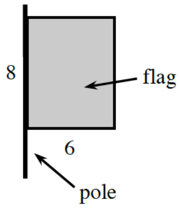
b.



c.



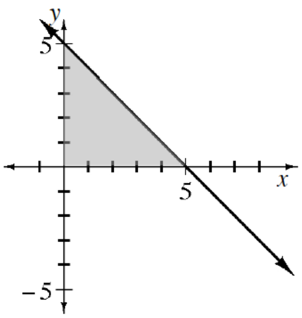
2. In this course, a "flag" is defined as a geometric region attached to a line segment (its "pole"). An example is shown here:



a. Imagine rotating the flag about its pole and describe the resulting three-dimensional figure. Draw a picture of this figure. To help you visualize this, use Desmos (desmos.com/calculator/fwarp6lgoh).

b. Calculate the volume of the rotated flag.

3. Examine the graph of the function $f(x) = 5 - x$:



a. Calculate the area of the shaded region.

b. Notice that the line dips below the x-axis when $x > 5$. When you are asked to calculate the "area under a curve" this refers to the region between the curve and the x-axis. Any area *below* the x-axis is considered to be negative. Calculate the area under the curve for $0 \leq x \leq 7$.

c. **[Challenge]** Determine the value of k such that the area under the curve for $0 \leq x \leq k$ is 0.

4. Sketch the function $g(x) = \sqrt{16 - x^2}$.

a. State the domain and range of g.

b. Use geometry to calculate the area under the curve for $0 \le x \le 4$.

c. Now calculate the area under the curve for $-4 \le x \le 4$

d. What is the relationship between the answers to parts (b) and (c)?

5. A car travels 50 miles per hour for two hours and 40 miles per hour for one hour.

a. Sketch a graph of velocity versus time. Label the axes with units.

b. Fill out the table below for the distance versus time.

Time [hours]	0.5	1.0	1.5	2.0	2.5	3.0
Distance [miles]						

c. Sketch a graph of distance versus time. Label the axes with units.

6. **[Challenge]** Translating Functions:

a. Graph the function $y = \frac{2}{3}x^2$. On the same set of axes graph a translation of the function that is shifted 1 unit to the right and 5 units down. Write the equation of the translated function.

b. Does the same strategy work for $y = \frac{2}{3}x$? Write an equation that will shift $y = \frac{2}{3}x$ one unit to the right and five units down.

c. Compare the graphs of $y = -\frac{1}{2}x$ and $y = -\frac{1}{2}(x + 2) + 3$. Describe their similarities and differences.

d. Explain how you know that the graph of $y = -9(x + 1) - 6$ goes through the point $(-1, -6)$ and has a slope of -9.

e. Sketch the graph of $y = 5(x - 2) - 1$.

7. **[Challenge]** Write the equation of the line through the point (–5, –2) with a slope of –3 in graphing form using the method developed in Problem 6.

8. **[Challenge]** Now you know *two* general equations used to write the equation of a line:

$y = mx + b$ and $y = m(x - h) + k$

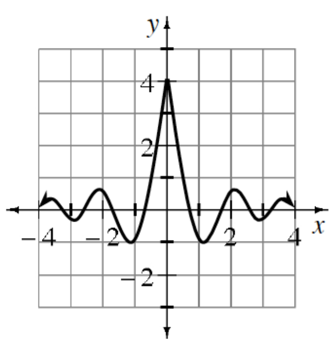
Under what circumstances is each equation easier to use? For parts (a) through (c) below, determine which method is best to use with the given information. Then, write the equation of the line.

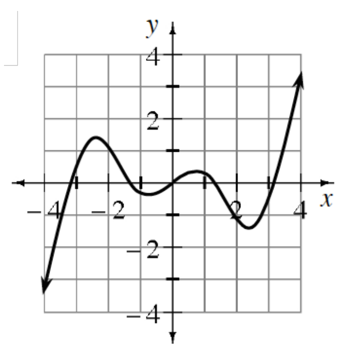
a. $m = -\frac{2}{5}$ and passes through $(-6, 2)$

b. $m = 3$ and $b = -6$

c. passes through (2, 8) and (1, 3)

9. **[Challenge]** For each function sketched below, sketch $y = f(-x)$ and compare it with the original graph. Then describe its symmetry.





Even and Odd Functions—Informally: A function that is symmetric with respect to the y-axis, like the one in part (a) above, is called an *even function*. A function that is symmetric with respect to the origin, like the one in part (b), is called an *odd function*. Sketch more examples of even and odd functions. Include how you can test whether a function is even or odd. Then list some famous even/odd functions that you have studied in a previous course, and the symmetries associated with even and odd functions.