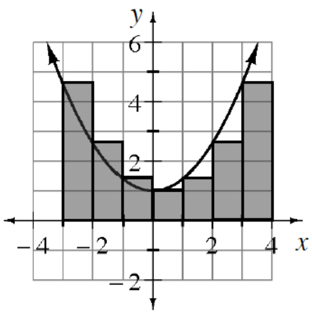
Homework #7

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

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

1. The graph of $j(x) = \frac{2}{5}x + 1$ is shown below. Desmos (desmos.com/calculator/qg4rwq9lf1).



a. Approximate the area under the curve for $-3 \le x \le 3$ by calculating the sum of the areas of the six left endpoint rectangles as shown. (The height of a left endpoint rectangle is determined by the function's value at the left x-value.)

b. Is the approximation in part (a) too high or too low? How can you tell?

c. Now, sketch this function with six right endpoint rectangles and compute the approximate area.

d. You should have obtained the same answers using right and left endpoint rectangles. Will this be true for all functions? If so, explain why. If not, explain what was special about this case that made the area estimates equal. Give an example of a case where the area estimates will be different.

2. A car travels at a rate of $v(t) = 20t + 30$ miles per hour for $0 \le t \le T$. Desmos (desmos.com/calculator/42ziymxuex).

a. Sketch a velocity graph and label the axes with the correct units.

b. Shade the area under the curve for $0 \le t \le T$. What does this area represent?

c. What are the units of the area? Explain how you know.

d. Compute the area under the curve for $0 \le t \le 2$. What does your answer represent?

3. If $f(x) = \frac{3}{x^2} + 1$. Desmos (desmos.com/calculator/lggw0uo1j0).

a. State the domain and range of f.

b. **[Challenge]** Write expressions for $f(-x)$, $f\left(\sqrt{x}\right)$, and $f(x+h)$.

4. Graph the following functions in Desmos and zoom out until you can clearly see its end behavior. Then, write an equation for the end-behavior function. Desmos (desmos.com/calculator/jopskwgjo4).

a. $y = 1 - \frac{1}{x}$

b. $y = \frac{3x^2}{6x+1}$

5. State the domain for each of the functions below.

a. $f(x) = \frac{x}{x^2+1}$

b. $g(x) = \frac{1}{x} - \frac{x}{x+1}$

c. $h(x) = \sqrt{x^2 - 9}$

d. **[Challenge]** $k(x) = \frac{\log(x-3)}{\sqrt{x+4}}$

6. Wei Kit knows that radical expressions can be rewritten using rational exponents. Study his examples below.

Examples: $\sqrt{x} = x^{1/2}$ $\left(\sqrt[5]{z}\right)^2 = z^{2/5}$ $\sqrt[3]{m^2} = m^{2/3}$

Rewrite the following radicals expressions with rational exponents

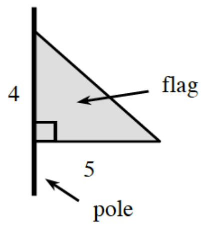
a. $\sqrt{k^7}$

b. $\sqrt[3]{t^4}$

c. $\left(\sqrt{n}\right)^4$

d. $\sqrt[5]{b^{31}}$

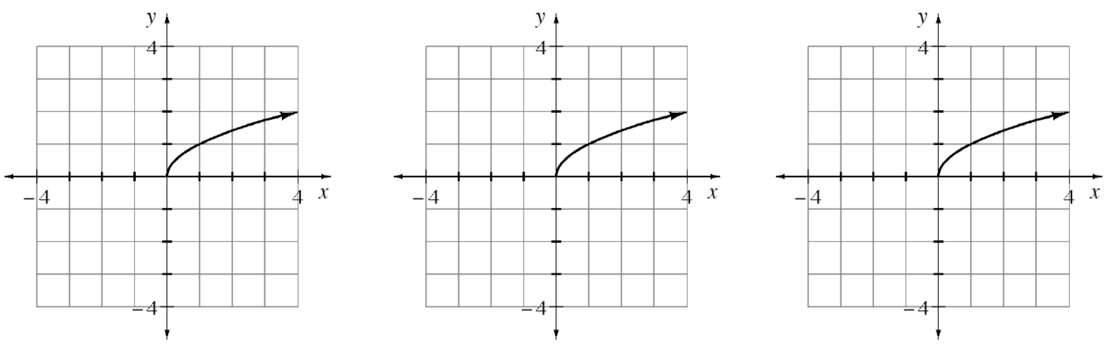
7. Imagine rotating the flag below about its pole.



a. Describe the resulting three-dimensional figure. Draw a picture of this figure. To help you visualize this, use Desmos (desmos.com/calculator/acdidfovgl). Click in the lower right corner of the graph to view it in full-screen mode.

b. Calculate the volume of the rotated flag.

8. **[Challenge]** Complete each graph so it will have each type of symmetry described below.



a. Reflection symmetry across the y-axis.

b. Reflection symmetry across the x-axis.

c. Point symmetry about the origin. (This means a 180° rotation about the origin leaves the graph unchanged.)

d. Recall the definitions of even and odd functions. For each part above, state if the graph is even, odd, or neither.