

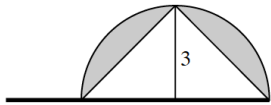
## Homework #20

First & Last Name: \_\_\_\_\_

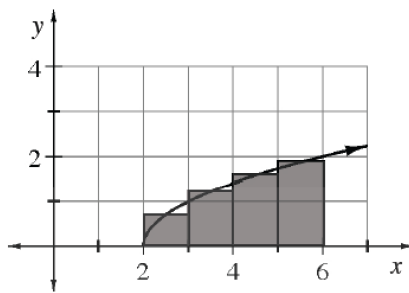
Class: \_\_\_\_\_

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

- Consider the function  $f(x) = \frac{1}{x-4}$ . [Desmos](https://www.desmos.com/calculator/hslnpio55n) (desmos.com/calculator/hslnpio55n)
  - Sketch a graph of the function. Label any holes or asymptotes.
  - Write an equation for the inverse of  $f$ . Is the inverse a function? Why or why not?
  - Sketch a graph of the inverse and compare this sketch to the graph of  $f$  from part (a).
- The shaded region below represents a flag (the upper boundary is a semi-circle). Calculate the volume of the solid formed when the flag is rotated about the pole. In a complete sentence, describe the rotated shape. To help you visualize this, use [Desmos](https://www.desmos.com/calculator/xw1vcblxc) (desmos.com/calculator/xw1vcblxc).

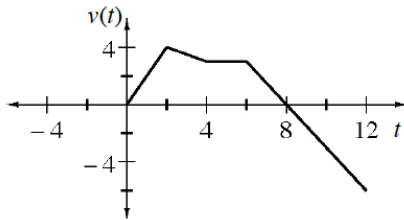


- For  $f(x) = \sqrt{x-2}$  the estimation of the area under the curve for  $2 \leq x \leq 6$  is shown below using four midpoint rectangles. Approximate the area using these rectangles. How reasonable is your result?



- Recall that the area between a function and the  $x$ -axis is defined as negative if the region is below the  $x$ -axis. Therefore, given  $f(x) = \frac{1}{2}x - 6$  what is the area under the curve for  $2 \leq x \leq 12$ ? [Desmos](https://www.desmos.com/calculator/bqqqx5ouv3) (desmos.com/calculator/bqqqx5ouv3).
- Expand and evaluate each of the following sums.
  - $\sum_{n=-4}^4 n^2$
  - $\sum_{k=-4}^4 k^3$
  - $\sum_{j=-3}^3 2^j$
  - [Challenge]**  $\sum_{i=-5}^5 \sin(i)$
- [Challenge]** Determine whether each function below is an even function, an odd function, or neither.
  - $f(x) = x^2$
  - $f(x) = x^3$
  - $f(x) = 2^x$
  - $f(x) = \sin(x)$

- A bug is walking on your graph paper along the  $x$ -axis. The bug's velocity (in feet per second) is shown on the graph below.



- a. When did the bug turn around?
- b. When was the bug's speed the greatest?
- c. After 12 seconds, how far is the bug from its starting position?
- d. Remember that acceleration is the rate of change of velocity. Calculate the acceleration of the bug at the following times.
  - i. 1 second
  - ii. 5 seconds
  - iii. 10 seconds

8. Let

$$f(x) = \begin{cases} x^2 - 1 & \text{for } x < 2 \\ 2x + 3 & \text{for } x \geq 2 \end{cases}$$

- a. What is  $f(2)$ ?
- b. As  $x \rightarrow 2^+$ ,  $y \rightarrow ?$
- c. As  $x \rightarrow 2^-$ ,  $y \rightarrow ?$
- d. What do the results from parts (b) and (c) indicate about the graph?