

# Homework #14

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

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

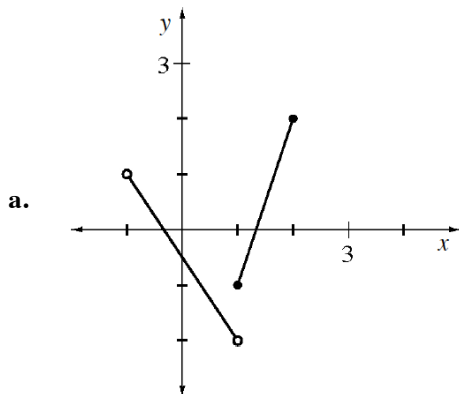
For homework to be graded, it must be *fully completed*. This means you must **show your work**.

1. Carefully graph the function:

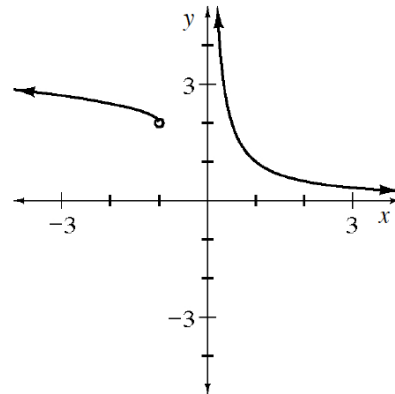
$$f(x) = \begin{cases} 3x + 4 & \text{for } x < 1 \\ -\frac{1}{2}x + 5.5 & \text{for } x \geq 1 \end{cases}$$

[Desmos](https://www.desmos.com/calculator/h2xxbblmji) (desmos.com/calculator/h2xxbblmji).

- a. Iveta wants to calculate the area under the curve for  $-1 \leq x \leq 5$ , so she decides to divide the region into ten trapezoids to approximate the area. Explain to Iveta why this is not the most efficient method.
  - b. Calculate the area under the curve for  $-1 \leq x \leq 5$ .
2. Identify the domain and range of each of the functions below. Then write a possible piecewise-defined function for each graph.

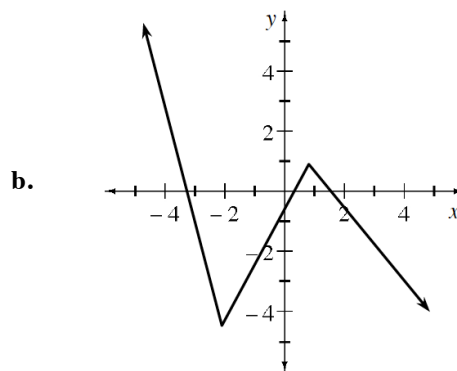
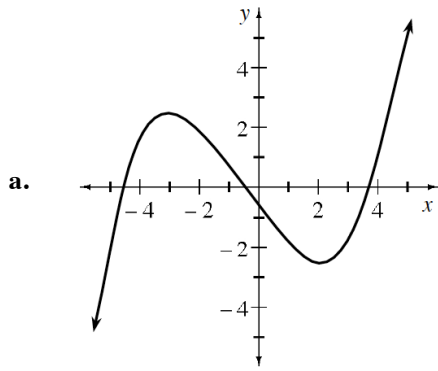


b. [Challenge]



3. Let  $f(x) = x^2 - x - 6$ . Approximate the area under the curve for  $-2 \leq x \leq 3$  using ten left endpoint rectangles.  
[Desmos](https://www.desmos.com/calculator/vgawvylkva) (desmos.com/calculator/vgawvylkva).
4. While studying the finite differences of a particular function, Neo noticed that the differences changed linearly. What can you tell him about the original function? Also, how do his finite differences change?
5. Let  $g(x) = \frac{1}{x^2 - x}$ .
  - a. State the domain of  $g$ .
  - b. [Challenge] Solve for  $x$  if  $g(x) = 0.5$ .
  - c. [Challenge] Explain why  $g$  does not have an inverse that is a function.
6. Let  $f(x) = x^2$  and  $g(x) = \sqrt{x}$ . Evaluate the following expressions.
  - a.  $f(3)$
  - b.  $f(-3)$
  - c.  $g(9)$
  - d.  $g(f(3))$
  - e.  $g(f(6))$
  - f.  $g(f(x))$
7. Examine two ways a line changes:
  - a. Sketch  $f(x) = 4x + 1$ . What are  $f(0)$ ,  $f(1)$ ,  $f(2)$ , and  $f(3)$ ? How are the function values changing as  $x$  increases?
  - b. Calculate the area under the curve for  $0 \leq x \leq a$  if  $a = 0, 1, 2$ , and  $3$ . How is the area changing as  $a$  increases?

8. For each graph below, state the intervals where the function is increasing and decreasing.



**c.** For part (a) on the interval in which the function is decreasing, is the rate of decrease constant? How do you know?