

## Section 5.1

After viewing the lecture videos and reading the textbook, you should be able to answer the following questions:

1. In general, how will we estimate the area under the graph of a nonnegative continuous function,  $y = f(x)$ , over a closed interval,  $[a, b]$ ?
2. To estimate the area under the graph of a positive continuous function,  $y = f(x)$ , over a closed interval,  $[a, b]$ , we use the formula

$$A \approx f(c_1) \cdot \Delta x + f(c_2) \cdot \Delta x + f(c_3) \cdot \Delta x + \cdots + f(c_n) \cdot \Delta x.$$

- a. What does  $A$  represent?
  - b. What does the symbol  $\approx$  mean?
  - c. What does  $n$  represent?
  - d. What does  $\Delta x$  represent? How can we calculate  $\Delta x$ ?
  - e. What do we mean when we talk about the  $k$ -th subinterval of  $[a, b]$ ?
  - f. What does  $c_k$  represent?
  - g. Other than “the value of  $f(x)$  at  $x = c_k$ ”, what does  $f(c_k)$  represent?
3. Suppose an object is moving only forwards in a straight line and that its velocity at a time  $t$  is given by  $v(t)$ . To find the **total distance traveled** over the time interval  $[a, b]$  we (select one):
    - a. Calculate  $v'(b) - v'(a)$ .
    - b. Find the area under the graph of  $y = v(t)$  over the interval  $[a, b]$ .
    - c. Find the area under the graph of  $y = v'(t)$  over the interval  $[a, b]$ .
    - d. Calculate  $v(b) - v(a)$ .
  4. What is the difference between **displacement** and **total distance traveled**?
  5. What is the average value of a nonnegative continuous function,  $y = f(x)$ , over a closed interval,  $[a, b]$ ?

6. You want to use finite approximations to estimate the area under the curve  $y = f(x)$  between  $x = 1$  and  $x = 2$  using the left endpoint method with 5 rectangles of equal width. What are the values of  $c_1, c_2, c_3, c_4$  and  $c_5$ ?
7. You want to use finite approximations to estimate the area under the curve  $y = f(x)$  between  $x = 1$  and  $x = 2$  using the right endpoint method with 6 rectangles of equal width. What are the values of  $c_1, c_2, c_3, c_4, c_5$  and  $c_6$ ?
8. You want to use finite approximations to estimate the area under the curve  $y = f(x)$  between  $x = 1$  and  $x = 2$  using the midpoint method with 4 rectangles of equal width. What are the values of  $c_1, c_2, c_3$  and  $c_4$ ?