

Section 5.2

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

1. What is sigma notation?
2. Suppose a sum can be written in sigma notation as $\sum_{k=1}^n a_k$.
 - a. What is Σ ? What does it stand for?
 - b. What is the index of summation?
 - c. What is the lower limit of summation?
 - d. What is the upper limit of summation?
 - e. What is the k -th term of the sum?
 - f. Write the sum without sigma notation.
3. The algebra rules for finite sums are:

$$\sum_{k=1}^n (a_k + b_k) = \sum_{k=1}^n a_k + \sum_{k=1}^n b_k$$

$$\sum_{k=1}^n (a_k - b_k) = \sum_{k=1}^n a_k - \sum_{k=1}^n b_k$$

$$\sum_{k=1}^n c a_k = c \cdot \sum_{k=1}^n a_k$$

$$\sum_{k=1}^n c = n \cdot c$$

Suppose $\sum_{k=1}^{13} a_k = 3$ and $\sum_{k=1}^{13} b_k = 5$. Find the values of:

- a. $\sum_{k=1}^{13} (a_k + b_k)$
- b. $\sum_{k=1}^{13} (a_k - b_k)$
- c. $\sum_{k=1}^{13} 7a_k$
- d. $\sum_{k=1}^{13} 11$
- e. $\sum_{k=1}^{13} (7a_k - b_k + 11)$

4. Which of the following is not true (select one):

- a. $\sum_{k=1}^n (a_k - 1) = \sum_{k=1}^n a_k - n$
- b. $\sum_{k=1}^n (a_k - 1) = \sum_{k=1}^n a_k - 1$
- c. $\sum_{k=1}^n (a_k - 1) = \sum_{k=1}^n a_k - \sum_{k=1}^n 1$

5. A Riemann sum for a bounded function f on a closed interval $[a, b]$ is the sum

$$S_P = \sum_{k=1}^n f(c_k) \cdot \Delta x_k.$$

- a. What does n represent?
 - b. The set P is called a **partition** of $[a, b]$. What is P ? (Answer: P is any set such that $P = \{x_0, x_1, x_2, \dots, x_{n-1}, x_n\}$ where $a = x_0 < x_1 < x_2 < \dots < x_{n-1} < x_n = b$)
 - c. What is the k -th subinterval of $[a, b]$?
 - d. What does Δx_k represent? How can we calculate Δx_k ?
 - e. What does c_k represent?
 - f. Other than "the value of $f(x)$ at $x = c_k$ ", what does $f(c_k)$ represent?
6. If P is a partition of $[a, b]$, what is $\|P\|$ (the **norm** of P)?
7. The Riemann sum for a continuous function f on a closed interval $[a, b]$ approximates (choose one):
- a. The total area of the region bounded by the curve $y = f(x)$ and the x -axis over the interval $[a, b]$.
 - b. The area above the x -axis of the region bounded by the curve $y = f(x)$ and the x -axis minus the area below the x -axis of the region bounded by the curve $y = f(x)$ and the x -axis over the interval $[a, b]$.
 - c. It is just a random sum that we defined.