# 5.1 EXERCISES

1. State whether the given sums are equal or unequal.

   a. $\displaystyle\sum_{i=1}^{10} i$ and $\displaystyle\sum_{k=1}^{10} k$

   b. $\displaystyle\sum_{i=1}^{10} i$ and $\displaystyle\sum_{i=6}^{15} (i-5)$

   c. $\displaystyle\sum_{i=1}^{10} i(i-1)$ and $\displaystyle\sum_{j=0}^{9} (j+1)j$

   d. $\displaystyle\sum_{i=1}^{10} i(i-1)$ and $\displaystyle\sum_{k=1}^{10} \left(k^2 - k\right)$

In the following exercises, use the rules for sums of powers of integers to compute the sums.

2. $\displaystyle\sum_{i=5}^{10} i$

3. $\displaystyle\sum_{i=5}^{10} i^2$

Suppose that $\displaystyle\sum_{i=1}^{100} a_i = 15$ and $\displaystyle\sum_{i=1}^{100} b_i = -12$. In the following exercises, compute the sums.

4. $\displaystyle\sum_{i=1}^{100} (a_i + b_i)$

5. $\displaystyle\sum_{i=1}^{100} (a_i - b_i)$

6. $\displaystyle\sum_{i=1}^{100} (3a_i - 4b_i)$

7. $\displaystyle\sum_{i=1}^{100} (5a_i + 4b_i)$

In the following exercises, use summation properties and formulas to rewrite and evaluate the sums.

8. $\displaystyle\sum_{k=1}^{20} 100\left(k^2 - 5k + 1\right)$

9. $\displaystyle\sum_{j=1}^{50} \left(j^2 - 2j\right)$

10. $\displaystyle\sum_{j=11}^{20} \left(j^2 - 10j\right)$

11. $\displaystyle\sum_{k=1}^{25} \left[(2k)^2 - 100k\right]$

Let $L_n$ denote the left-endpoint sum using $n$ subintervals and let $R_n$ denote the corresponding right-endpoint sum. In the following exercises, compute the indicated left and right sums for the given functions on the indicated interval.

12. $L_4$ for $f(x) = \dfrac{1}{x-1}$ on $[2, 3]$

13. $R_4$ for $g(x) = \cos(\pi x)$ on $[0, 1]$

14. $L_6$ for $f(x) = \dfrac{1}{x(x-1)}$ on $[2, 5]$

15. $R_6$ for $f(x) = \dfrac{1}{x(x-1)}$ on $[2, 5]$

16. $R_4$ for $\dfrac{1}{x^2+1}$ on $[-2, 2]$

17. $L_4$ for $\dfrac{1}{x^2+1}$ on $[-2, 2]$

18. $R_4$ for $x^2 - 2x + 1$ on $[0, 2]$

19. $L_8$ for $x^2 - 2x + 1$ on $[0, 2]$

20. Compute the left and right Riemann sums—$L_4$ and $R_4$, respectively—for $f(x) = (2 - |x|)$ on $[-2, 2]$. Compute their average value and compare it with the area under the graph of $f$.

21. Compute the left and right Riemann sums—$L_6$ and $R_6$, respectively—for $f(x) = (3 - |3 - x|)$ on $[0, 6]$. Compute their average value and compare it with the area under the graph of $f$.

22. Compute the left and right Riemann sums—$L_4$ and $R_4$, respectively—for $f(x) = \sqrt{4 - x^2}$ on $[-2, 2]$ and compare their values.

23. Compute the left and right Riemann sums—$L_6$ and $R_6$, respectively—for $f(x) = \sqrt{9 - (x-3)^2}$ on $[0, 6]$ and compare their values.

Express the following endpoint sums in sigma notation but do not evaluate them.