MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use a finite approximation to estimate the area under the graph of the given function on the stated interval as instructed.

1) \( f(x) = \frac{1}{x} \) between \( x = 4 \) and \( x = 5 \) using a lower sum with two rectangles of equal width.

A) \( 1 \)  
B) \( \frac{181}{15} \)  
C) \( \frac{19}{90} \)  
D) \( \frac{7}{4} \)

2) \( f(x) = x^2 \) between \( x = 0 \) and \( x = 1 \) using the "midpoint rule" with two rectangles of equal width.

A) \( 0.3125 \)  
B) \( 0.625 \)  
C) \( 0.75 \)  
D) \( 0.125 \)

3) \( f(x) = \frac{1}{x} \) between \( x = 3 \) and \( x = 6 \) using a upper sum with two rectangles of equal width.

A) \( \frac{15}{18} \)  
B) \( \frac{13}{43} \)  
C) \( \frac{13}{144} \)  
D) \( -\frac{15}{18} \)

4) \( f(x) = x^2 \) between \( x = 4 \) and \( x = 8 \) using an upper sum with four rectangles of equal width.

A) \( 174 \)  
B) \( 165 \)  
C) \( 149 \)  
D) \( 126 \)

Write the sum without sigma notation and evaluate it.

5) \( \sum_{k=1}^{3} \frac{k + 10}{k} \)

A) \( \frac{1 + 10}{1} \cdot \frac{2 + 10}{2} \cdot \frac{3 + 10}{3} = 286 \)  
B) \( \frac{1 + 10}{1} + \frac{2 + 10}{2} + \frac{3 + 10}{3} = \frac{64}{3} \)  
C) \( \frac{1 + 10}{1} + \frac{3 + 10}{3} = \frac{46}{3} \)  
D) \( \frac{1 + 10}{1} + \frac{2 + 10}{2} + \frac{3 + 10}{3} = 36 \)

6) \( \sum_{k=1}^{3} (-1)^k \sin \frac{7\pi}{2} \)

A) \( -\sin \frac{7\pi}{2} - \sin \frac{7\pi}{2} = 2 \)  
B) \( -\sin \frac{7\pi}{2} + \sin \frac{7\pi}{2} - \sin \frac{7\pi}{2} = -1 \)  
C) \( -\sin \frac{7\pi}{2} + \sin \frac{7\pi}{2} - \sin \frac{7\pi}{2} = 1 \)  
D) \( -\sin \frac{7\pi}{2} + \sin \frac{7\pi}{2} - \sin \frac{7\pi}{2} = 0 \)

Provide an appropriate response.

7) Which of the following express \(-3 + 9 - 27 + 81 - 243\) in sigma notation?

I. \( \sum_{k=1}^{5} (-1)^k 3^k \)  
II. \( \sum_{k=2}^{6} (-3)^{k-1} \)  
III. \( \sum_{k=1}^{5} (-1)^{k-1} 3^k \)

A) II only  
B) I, II, and III  
C) III only  
D) I and II
Evaluate the sum.

8) \[ \sum_{k=1}^{8} (k^2 - 8) \]

A) 204  
B) 140  
C) 196  
D) 56

8) ______

Graph the function \( f(x) \) over the given interval. Partition the interval into 4 subintervals of equal length. Then add to your sketch the rectangles associated with the Riemann sum \( \sum_{k=1}^{4} f(c_k) \Delta x_k \), using the indicated point in the kth subinterval for \( c_k \).

9) \( f(x) = x^2 - 2, \ [0, 8] \), midpoint

9) ______
Find the formula and limit as requested.

10) For the function \( f(x) = 12 - 2x^2 \), find a formula for the lower sum obtained by dividing the interval \([0, 1]\) into \( n \) equal subintervals. Then take the limit as \( n \to \infty \) to calculate the area under the curve over \([0, 1]\).

A) \( \frac{2n^3 + 3n^2 + n}{3n^3} \); Area = \( \frac{2}{3} \)

B) \( 12 - \frac{2n^3 + 3n^2 + n}{3n^3} \); Area = \( \frac{34}{3} \)

C) \( 12 - \frac{4n^3 + 6n^2 + 2n}{3n^3} \); Area = \( \frac{34}{3} \)

D) \( 12 + \frac{2n^3 + 3n^2 + 1}{3n^3} \); Area = \( \frac{38}{3} \)

11) For the function \( f(x) = 4x + 3 \), find a formula for the upper sum obtained by dividing the interval \([0, 3]\) into \( n \) equal subintervals. Then take the limit as \( n \to \infty \) to calculate the area under the curve over \([0, 3]\).

A) \( 9 - \frac{36n^2 + 36n}{2n^2} \); Area = \( -9 \)

B) \( 9 + \frac{36n^2 + 36n}{2n^2} \); Area = \( \frac{54}{5} \)

C) \( 9 + \frac{36n^2 + 36n}{2n^2} \); Area = \( 27 \)

D) \( 9 + \frac{33n^2 + 37n}{2n^2} \); Area = \( \frac{51}{2} \)