
1. (1 pt)
The following sum can be interpreted as a sum of areas of rectangles which approximate the area of a plane region \( R \). By taking the limit of this sum, approximate the area of \( R \).

\[
S_n = \sum_{i=1}^{n} \frac{2}{n} \left( 1 + \frac{2i}{n} \right)
\]

Area of \( R = \boxed{\text{square units}} \)

2. (1 pt)
Express the limit

\[
\lim_{n \to \infty} \sum_{i=1}^{n} \frac{6}{n} \ln \left( 1 + \frac{6i}{n} \right)
\]

as a definite integral \( \int_0^b f(x)dx \) by finding \( b \) and \( f(x) \).

\[ b = \boxed{\text{}} \]

\[ f(x) = \boxed{\text{}} \]

3. (1 pt)
Simplify the following expression.

\[
7 \int_a^b f(x)dx + 7 \int_b^c f(x)dx - 5 \int_c^a f(x)dx
\]

A. \( 7 \int_a^c f(x)dx + 5 \int_c^a f(x)dx \)
B. \( 12 \int_a^b f(x)dx \)
C. \( 24 \int_a^b f(x)dx \)
D. \( 12 \int_b^c f(x)dx \)
E. \( 2 \int_b^c f(x)dx \)

4. (1 pt)
Evaluate the following integral using properties of definite integrals and interpreting integrals as areas:

\[
\int_{-1}^{6} (4x - 2)dx
\]

5. (1 pt)
Evaluate the following integral using properties of definite integrals and interpreting integrals as areas.

\[
\int_{-4}^{a} \sqrt{16 - x^2} dx
\]

6. (1 pt)
Evaluate the following integral using properties of definite integrals and interpreting integrals as areas.

\[
\int_{-\pi/4}^{\pi/4} \sin x dx
\]

7. (1 pt)
Evaluate the following integral using properties of definite integrals and interpreting integrals as areas.

\[
\int_{-2}^{3} (5u^3 - 5u^9 + \frac{\pi}{2}) du
\]

8. (1 pt)
Given \( \int_0^a x^2 dx = \frac{a^3}{3} \)

evaluate \( \int_0^2 (3v^2 + 4v + 6) dv \)

A. \( \pi \)
B. \( 56 \)
C. \( 0 \)
D. \( 28 \)
E. \( 9.3 \)

9. (1 pt)
Find \( \int_0^2 g(x)dx \), where

\[
g(x) = \begin{cases} x^2, & 0 \leq x \leq 1 \\ x^3, & 1 < x \leq 2 \end{cases}
\]

10. (1 pt)
Consider the function \( f(x) = x \).

Which of the following statements is true? Check all that apply.

A. \( f(x) \) is an even function.
B. There exists \( c \) in \([a,b]\) such that \( \int_a^b f(x)dx = (b - a)f(c) \).
C. \( f(x) \) has the property \( \int_a^b f(x)dx = 2 \int_0^a f(x)dx \).
D. \( f(x) \) is an odd function.
E. \( f(x) \) has the property \( \int_a^b f(x)dx = 0 \).

11. (1 pt)
What is \( \int_{-13}^{13} \sqrt{169 - x^2} dx \)?

12. (1 pt)
Which of the following integrals are negative?

A. \( \int_0^3 x^2 + 3x + 4 dx \)
B. \( \int_{-1}^{2} x - \sin(x) dx \)
C. \( \int_{-1}^{0} \sin(x) dx \)
D. \( \int_{-1}^{2} \sin(x) dx \)
E. \( \int_{-3\pi/2}^{\pi} \cos(x) dx \)
F. All of the above
G. None of the above
13. (1 pt) 
What is 
\[ \int_{\frac{5\pi}{2}}^{\frac{9\pi}{2}} \cos(x) + \sqrt{\pi^2 - \left(\frac{x - \frac{7\pi}{2}}{2}\right)^2} + 5x \, dx \] 
What is the average value of this function over the interval \[ \left[ \frac{5\pi}{2}, \frac{9\pi}{2} \right] \]?

14. (1 pt) 
Write the expression 
\[ \lim_{n \to \infty} \sum_{i=0}^{n-1} \left(1 + \frac{5i}{n}\right)^2 \left(1 + \frac{5i}{n}\right) + 16 \frac{5}{n} \]

as a definite integral, \( \int_{a}^{b} f(x) \, dx \).

\[ a = \quad \text{________________} \]
\[ b = \quad \text{________________} \]
\[ f(x) = \quad \text{________________} \]

15. (1 pt) 
What is 
\[ \int_{9}^{25} \sqrt{64 - (x - 17)^2} + 10 \, dx \] 
What is the average value of this function over the interval \[ [9, 25] \]?

16. (1 pt) 
Write the expression 
\[ \lim_{n \to \infty} \sum_{i=0}^{n-1} \sin \left(\frac{4\pi i}{n}\right)^2 \frac{4\pi}{n} \]

as a definite integral, \( \int_{a}^{b} f(x) \, dx \).

\[ a = \quad \text{________________} \]
\[ b = \quad \text{________________} \]
\[ f(x) = \quad \text{________________} \]

17. (1 pt) 
Write the expression 
\[ \lim_{n \to \infty} \sum_{i=0}^{n-1} i \]

as a definite integral, \( \int_{a}^{b} f(x) \, dx \).

\[ a = \quad \text{________________} \]
\[ b = \quad \text{________________} \]
\[ f(x) = \quad \text{________________} \]

18. (1 pt) 
Write the expression 
\[ \lim_{n \to \infty} \sum_{i=0}^{n-1} 8 \ln \left(4\left(2 + \frac{8i}{n}\right)\right) \]

as a definite integral, \( \int_{a}^{b} f(x) \, dx \).

\[ a = \quad \text{________________} \]
\[ b = \quad \text{________________} \]
\[ f(x) = \quad \text{________________} \]

19. (1 pt) 
What is 
\[ \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} |x| + \cos(x) \, dx \]