

1. Find an estimate of the area under the graph of $y = \frac{1}{x}$ from $x=1$ to $x=9$ using $n=4$ with the mid-points rule.

2. If $f(x) = \begin{cases} |x-1| & \text{if } 0 \leq x \leq 2 \\ \sqrt{9-(x-5)^2} & \text{if } 2 < x \leq 8 \end{cases}$, find the value of $\int_0^8 f(x) dx$.

3. Use the definition of the integral to evaluate the integral

$$\int_{-2}^0 (x^2 - x) dx$$

4. A particle moves along a line so that its velocity at time t is given by $v(t) = t^2 - t - 6$ (in meter per second), find the distance travelled during the interval $t \in [1,4]$.

5. If $f(x) = \int_2^{\sec x} \frac{\sqrt{t^2-1}}{t} dt$, and $0 < x < \frac{\pi}{2}$. Find the slope of the tangent line to the curve $y = f(x)$ at $x = \frac{\pi}{3}$.

6. Evaluate $\int (\pi^x + x^\pi) dx$