Problem 1: (5 points) Estimate the area under the graph of \( f(x) = 1 + x^3 \) from \( x = 0 \) to \( x = 3 \) using four approximating rectangles and taking the sample point to be the left endpoint.

Problem 2: (4 points) Write the limit as a definite integral on \([0, 2\pi]\):

\[
\lim_{n \to \infty} \sum_{i=1}^{n} \frac{4\pi^2 i}{n^3} \sin \left(1 + \frac{2\pi i}{n}\right)
\]

Problem 3: (4 points) Evaluate \( \int \frac{1 - \sin x}{\cos^2 x} \, dx \)
**Problem 4: (4 points)** If \( f(x) = \int_{\frac{1}{x^2}}^{1-x} t^2 \tan^{-1} t \, dt \) find \( f'(1) \).

**Problem 5: (8 points)** Consider the area under the curve \( f(x) = e^x \) from \( x = 0 \) to \( x = 1 \).

a. Write the area as a limit of the Riemann sum.

b. Write the area as a definite integral and find it.