Problem 1. Evaluate the following (indefinite) integrals:
\[ a) \int (x^{1/3} + x^{1/4})^{-1} \, dx \]
\[ b) \int \frac{2x}{(1 + x + x^2)} \, dx \]

Problem 2. Evaluate the following (definite) integrals:
\[ a) \int_1^e \cos(\ln x) \, dx \]
\[ b) \int_0^\infty e^{-x} (1 - e^{-2x})^{1/2} \, dx \]

Problem 3. a) Suppose that \( f(x) \) is a function defined on \([a, b]\). State the formula for the length of the curve defined by the graph of \( f(x) \).

b) Find that length in the case when \( f(x) = \ln x \), \( a = 1 \), and \( b = \sqrt{3} \).

Problem 4. Determine (providing an explanation) convergence or divergence of the following series:
\[ a) \sum_{n=1}^\infty \frac{\ln n}{n} \]
\[ b) \sum_{n=1}^\infty \sin(1/n) \]
\[ c) \sum_{n=2}^\infty (\ln n)^{-n} \]

Problem 5. Estimate the error in approximating the following series by the sum of its first 10 terms:
\[ a) \sum_{n=1}^\infty \frac{1 + \cos n}{n^b} \]
\[ b) \sum_{n=1}^\infty \frac{(-1)^n}{\ln n} \]