1. Determine the value of each of the following:
   a. \( \int_1^2 \frac{x^3 - x + 1}{x^2} \, dx \)
   b. \( \int_0^1 \frac{x^3 - x + 1}{x^2 + 1} \, dx \)

2. Use the method of partial fractions to evaluate the following indefinite integral:
   \( \int \frac{20}{100 - x^2} \, dx \)

3. Use the textbook Table of Integrals to evaluate each of the following indefinite integral:
   a. \( \int \frac{x + 1}{4x^2 + 1} \, dx \)
   b. \( \int \frac{20}{200 - 10x - 2x^2} \, dx \)

4. Suppose that \( k \) is a constant.
   a. Use the method of integration by parts to evaluate the following definite integral:
      \( \int_0^1 x e^{kx} \, dx \)
   b. For what values of \( k \) does \( \int_0^\infty x e^{kx} \, dx \) converge?

5. Determine whether the following improper integral converges, and, if so, what it converges to:
   \( \int_0^\infty \frac{1}{e^{18x}} \, dx \)

6. Determine the value of the following definite integral:
   \( \int_{-0.3}^{0.7} \cos(\pi[\frac{t}{2} + 0.15]) \, dt \).
7. Suppose you know that $f$ is a function with the property that
\[ \int_{0}^{4} f(x) \, dx = 7. \]
Evaluate each of the following definite integrals by using the method of substitution:
\[ \int_{0}^{8} f\left(\frac{x}{2}\right) \, dx \quad \text{and} \quad \int_{8}^{7} f(32 - 4x) \, dx \]

8. Use the integral test to determine whether
\[ \sum_{n=1}^{\infty} \frac{1}{n(1 + [\ln(n)]^2)} \]
converges.

9. For what values of $k$ does
\[ \sum_{n=2}^{\infty} \frac{1}{n[\ln(n)]^k} \]
converge?

10. 
   a. Solve the differential equation:
   \[ \frac{dy}{dx} = x(2x - 1)^{48}. \]
   b. Solve the initial value problem:
   \[ \frac{dy}{dx} = x(2x - 1)^{48}; \quad y = 0.01 \text{ when } x = 1 \]
11. The graph of \( g' \) (not \( g \)) is shown on the coordinate system below. It is known that: \( g(-3) = -8 \). Using the same coordinate system, draw a rough sketch of the graph of \( g \).