1. Use the tables on the endpapers of your text to evaluate the integral
\[
\int \frac{dx}{1 + e^x}
\]

2. Use the tables on the endpapers of your text to evaluate the following integral. First make the substitution \( u = x^2 \)
\[
\int \frac{2u \, du}{9 - u^2}
\]

3. Use the Riemann sum with right endpoint evaluation and two intervals to approximate the integral.
\[
\int_0^2 x^3 \, dx
\]
Sketch the function and the approximation on the same graph.

4. Set up the Simpson’s Rule approximation for the definite integral of 3., using 4 subintervals.
Simpson’s rule:
\[
\int_a^b f(x) \, dx = \left( \frac{b - a}{3n} \right) \left[ y_0 + 4y_1 + 2y_2 + 4y_3 + 2y_4 + \cdots + 2y_{n-2} + 4y_{n-1} + y_n \right]
\]

5. Compute the integral
\[
\int_0^{10} \frac{dx}{4(x-1)(x-2)^2}
\]
by partial fractions.

6. Set up the partial fractions decomposition for the expression
\[
\frac{3x^2 - x + 2}{(x+3)(x-7)(x^2 + 4)}
\]
but DO NOT FIND THE UNKNOWN COEFFICIENTS.

7. Evaluate the integral.
\[
\int_0^1 \frac{dx}{2 \sqrt{x}}
\]

8. Evaluate the integral.
\[
\int_2^\infty \frac{1}{x^2} \, dx
\]

9. Solve the initial value problem \( \frac{dy}{dx} = xy^2 ; \, y(0) = -1 \).

10. Solve the initial value problem \( \frac{dy}{dx} + xy = x ; \, y(2) = 1 \).

11. Suppose that a radioactive substance decays with a half life of 200 days, and 30 gms are initially present.
   (a) Find a formula for the amount of the substance present at any time \( t \).
   (b) How long will it be before there are 10 gms present?

12. Suppose that an initial population of 25000 bacteria grows exponentially at the rate of 2% per hr. Find the number \( y(t) \) of bacteria at time \( t \). How long does it take for the population to double.
13. A direction field for the differential equation \( y' = x^2 - y^2 \) is shown below. Sketch on the direction field the graph of the solution that satisfies each of the following initial conditions.

(a) \( y(-2) = 1 \)   \hspace{1cm} (b) \( y(0) = 2 \)   \hspace{1cm} (c) \( y(1) = 2 \)