Exam 2

1. For the following statements, write T or F to indicate that the statement is true or false. (4 pts each)

True or False

(a) \( \frac{x - 5}{x^2(x^2 + 1)} = \frac{A}{x^2} + \frac{Bx + C}{x^2 + 1} \) for some real number A, B and C.

(b) \( \int_{1}^{\infty} \frac{1}{x} \, dx \) converges.

(c) Suppose we have \( \{a_n\} = \{-3, 1, 5, 9, \ldots\} \). Then \( a_{10} = 33 \).

2. Answer the following questions. (9 pts each)

(a) For the sequence \( \{a_n\} = \{1, -3, 9, -27, 81, \ldots\} \), find the recurrence relation.

(b) Some values of a continuous function \( f(x) \) are given below.

\[
\begin{array}{ccccccccccc}
x & 0 & 0.5 & 1 & 1.5 & 2 & 2.5 & 3 & 3.5 & 4 & 4.5 & 5 \\
f(x) & 12 & 6 & 3 & 2 & -2 & -5 & 3 & 6 & 7 & 3 & 10 \\
\end{array}
\]

Use Simpson’ Rule with \( n = 6 \) to estimate \( \int_{1}^{4} f(x) \, dx \).
3. Find the general solution of the differential equation \( y'(t) = 2y + 5 \). You may assume \( 2y + 5 \geq 0 \). (10 pts)

4. Determine whether the following integrals converge or diverge. If they converge, evaluate the integrals. (12 pts each)

(a) \( \int_{-\infty}^{0} e^{3x} \, dx \)
5. Evaluate the following integrals. (12 pts each)

\( \int_0^8 \frac{dx}{\sqrt{8-x}} \)

\( \int \sqrt{25-x^2} \, dx \)
(b) \[ \int_0^1 \frac{x - 1}{x^2 + 3x + 2} \, dx \]

(c) \[ \int \frac{1}{(x + 5)^2(x - 1)} \, dx \]