1. Determine whether the series is convergent or divergent. Use the test given.
   a. alternating series test \( \sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}} \)
   b. comparison test \( \sum_{n=1}^{\infty} \frac{2}{n^3 + 4} \)
   c. geometric series \( \sum_{n=1}^{\infty} \frac{\left(\frac{3}{5}\right)^n}{5^n} \)
   d. integral test \( \int \frac{\ln(x)}{x} \)
   e. limit comparison test \( \sum_{n=1}^{\infty} \frac{n + 5}{\sqrt{n^7 + n^2}} \)
   f. p-series \( \sum_{n=1}^{\infty} \frac{1}{\sqrt{n}} \)
   g. ratio test \( \sum_{n=1}^{\infty} \frac{n^2}{2^n} \)
   h. divergence test \( \sum_{n=1}^{\infty} \frac{1}{3 + 2^n} \)

2. Find the interval of convergence. \( \sum_{n=1}^{\infty} \frac{(-1)^n (x - 2)^n}{n \cdot 2^n} \)

3. Find the sum of the series \( \sum_{n=1}^{\infty} \frac{2^n}{3^n} \)

4. Approximate the sum of the series \( \sum_{n=1}^{\infty} \frac{\left(\frac{1}{3}\right)^n}{n^6} \) accurate to 5 decimal places.

5. Find a power series representation for \( f(x) = \frac{1}{1 - x^3} \)

6. Use a binomial series to expand \( \frac{1}{(x + 1)^4} \)
7. Find the solution of the differential equation \( \frac{dz}{dt} + e^{t+z} = 0 \)

8. Find the recursion relation to solve the initial value problem using a power series.
\[ y'' - xy' + 2y = 0 \]

9. Find parametric equations of the line passing though \((1,2,4)\) and in the direction of \(v = 2i + j + 3k\)

10. If \(a = i + j - 2k\) \(b = 3i - 2j + k\) and \(c = j - 5k\) calculate
    a) \(a \cdot (b \times c)\)  
    b) \(\text{proj}_b\)  
    c) \(2a + 3b\)

11. Find the equation of the plane containing the point \((4,1,1)\) and with normal vector \(<2,6,-3>\).

12. A constant force \(F = 3i + 5j + 10k\) moves an object along the line segment from \((1,0,2)\) to \((5,3,8)\). Find the work done if the distance is measured in meters, and the force in newtons.

13. For each of the following series, write the general form.
    a) alternating series
    b) binomial series
    c) geometric series
    d) Maclaurin series
    e) Power series centered about \(a\)
    f) p-series
    g) Taylor series