Comparison Test, Limit Comparison Test and Alternating Series

1. Determine whether the series $\sum_{i=1}^{\infty} \frac{1}{2^i + i}$ is convergent or divergent?

2. Show that the series $\sum_{n=10}^{\infty} \frac{1}{n} - \frac{1}{n-1}$ is convergent and find its value. Use this to give another proof that the series $\sum_{n=1}^{\infty} \frac{1}{n^2}$ is convergent.

3. Determine whether the series $\sum_{n=1}^{\infty} \frac{n^3}{n^4 - 2}$ is convergent or divergent?

4. Determine whether the series $\sum_{n=1}^{\infty} \frac{\ln(n)}{n}$ is convergent or divergent?

5. Determine whether the series $\sum_{n=1}^{\infty} \frac{n^3}{n^4 + 2}$ is convergent or divergent?

6. Determine whether the series $\displaystyle\sum_{n=1}^{\infty} \frac{3n^{\frac{3}{2}} + 5n^2 + 7n^{\frac{7}{2}}}{2n^2 + 9}$ is convergent or divergent?

7. We use the sum of the first 100 terms of the series $\displaystyle\sum_{n=1}^{\infty} \frac{3^{n-1}}{7^n + 5}$ to approximate the value of the series.

   Estimate the error involved in this approximation.

8. Show that the alternating harmonic series $\displaystyle\sum_{n=1}^{\infty} (-1)^{n-1} \frac{1}{n}$ is convergent.

9. Determine whether the series $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{n^2}{n^3 + 1}$ is convergent or divergent?

10. Determine whether the series $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{2n^2}{3n^2 - 1}$ is convergent or divergent?

11. Approximate the sum of the series $\displaystyle\sum_{n=0}^{\infty} (-1)^n \frac{1}{n!}$ with an error smaller than 10^{-3}.