1. Test the following series for convergence. If the series converges, find the sum.

(a) \[ \sum_{n=1}^{\infty} \left[ \sin \left( \frac{1}{n} \right) - \sin \left( \frac{1}{n+1} \right) \right] \]

(b) \[ \sum_{n=1}^{\infty} \frac{3^{n+1}}{2^n} \]

(c) \[ \sum_{n=1}^{\infty} \frac{2^{n+1}}{3^n} \]

(d) \[ \sum_{n=1}^{\infty} \ln \left( \frac{n}{n+1} \right) \]

2. Test each of the following series to determine whether it converges or diverges.

(a) \[ \sum_{n=1}^{\infty} \frac{n^7}{2n^4 + 1} \]

(b) \[ \sum_{n=1}^{\infty} ne^{-n^2} \]

(c) \[ \sum_{n=1}^{\infty} \frac{6^n}{(n+1)^{25n+3}} \]

3. Consider the series \[ \sum_{n=0}^{\infty} (-1)^n \frac{1}{3^n n!} \].
   (a) Show that this series converges.
   (b) Estimate the sum of this series to within 0.005.

4. Estimate the sum of the series \[ \sum_{n=1}^{\infty} \frac{1}{n^4} \] to within 0.006.