Problem 1: Determine whether the following series diverge, converge conditionally, or converge absolutely:

(a) $\sum_{n=1}^{\infty} \frac{(-1)^n}{n+1}$

(b) $\sum_{n=0}^{\infty} \frac{(-1)^n}{6^n}$

(c) $\sum_{n=2}^{\infty} (-1)^n \frac{n}{\ln n}$

(d) $\sum_{n=1}^{\infty} (-1)^n \frac{\ln n}{n}$

(e) $\sum_{n=0}^{\infty} \frac{(-1)^{n+1}}{n!}$

(f) $\sum_{n=1}^{\infty} \frac{\cos(\pi n)}{n}$

(g) $\sum_{n=1}^{\infty} \frac{\cos(\pi n)}{n^2}$

(h) $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}}$

(i) $\sum_{n=0}^{\infty} \frac{(-1)^n n}{n^2+4}$

(j) $\sum_{n=0}^{\infty} \frac{(-1)^{n+1} n}{3^n}$

(k) $\sum_{n=1}^{\infty} \frac{(-n)^n}{n^2}$

(l) $\sum_{n=1}^{\infty} (-1)^n \sin\left(\frac{\pi}{n}\right)$

(m) $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n\sqrt{n}}$

(n) $\sum_{n=2}^{\infty} \frac{(-1)^n}{n \ln n}$

(o) $\sum_{n=0}^{\infty} \frac{(-1)^{n-1}}{(n+4)^2}$

(p) $\sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{\ln n}$

Problem 2: Explain why the following series converge. Find the sum of the first 5 terms of the series. How close is this to the actual sum of the series? Find an interval containing the sum of the series.

(a) $\sum_{n=1}^{\infty} (-1)^n \frac{5}{n}$

(b) $\sum_{n=1}^{\infty} \frac{(-1)^n n}{2^n}$

(c) $\sum_{n=1}^{\infty} \frac{(-1)^n}{n!}$

(d) $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n6^n}$

(e) $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}$

Problem 3: Determine the sum of the series to an error at most ten thousand, i.e. within 0.001.

(a) $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}$

(b) $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^3}$

(c) $\sum_{n=1}^{\infty} \frac{(-1)^{n}}{5n^2+6}$

(d) $\sum_{n=1}^{\infty} \frac{(-2)^{n}}{(2n!)}$

(e) $\sum_{n=1}^{\infty} \frac{(-1)^{n}}{e^n}$