1. (30 pts.) Find the interval of convergence for the following power series:

(a) \( \sum_{n=0}^{\infty} \frac{(n-2)(x-1)^n}{n^2} \)  
(b) \( \sum_{n=1}^{\infty} \frac{x^n}{3^n n^2} \)

2. (30 pts.) Determine whether each of the following sequences or series converges to a real number. If so, find the limit. Otherwise state that the sequence or series diverges.

(a) \( \left( \frac{n-1}{n} \right)^{(n^2)} \)  
(b) \( \cos \left( \frac{n\pi}{4} \right) \)  
(c) \( \sum_{n=0}^{\infty} \left( \frac{1}{5^n} + \frac{2}{3^{n+1}} \right) \)

3. (20 pts.) For each of the following series find the set of all \( p \) such that the given series converges.

(a) \( \sum_{n=0}^{\infty} \frac{(-1)^n}{n^p} \)  
(b) \( \sum_{n=2}^{\infty} \frac{1}{n \ln(n)^p} \)

4. (20 pts.) Find the Taylor polynomial for \( \ln x \) of degree \( n = 2 \) centered at \( a = 1 \). Estimate the error of approximating \( \ln \left( \frac{9}{10} \right) \) with the above polynomial.