Homework 2

MATH 472

1) Please email me your homework as a single pdf file.
2) Show your work clearly. Justify all your answers.

1. Determine whether the given series converges absolutely, converges conditionally, or diverges:

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

   (b) $\sum_{k=1}^{\infty} (-1)^k \ln \left(1 + \frac{1}{k}\right)$

2. Determine the convergence or divergence of the following series using the Ratio or the Root test:

   (a)
   $$\sum_{k=2}^{\infty} \frac{k}{(\ln k)^k}$$

   (b)
   $$\sum_{k=1}^{\infty} \frac{3^{2k+1}}{(k^{2k})^k}$$

3. Find the values of x for which the given series converges:
   $$\sum_{k=1}^{\infty} \frac{(x+2)^k k!}{2^k}$$

4. Consider the series $\sum_{k=1}^{\infty} a_k$ where $a_{2n} = \frac{1}{3^n}$ and $a_{2n-1} = \frac{1}{3^{n+1}}$ with $n \in \mathbb{N}$. Show that the Root test is conclusive but the Ratio test is not.