Homework 1

MATH 472

Show your work clearly. Justify all your answers.

1. Determine whether the following series converge or diverge. Explain clearly.
   (a) $\sum_{k=1}^{\infty} \frac{3^{k-1}-2^k}{6^k}$
   (b) $\sum_{k=1}^{\infty} \frac{k}{e^k}$
2. Find all values of x for which the given series converges:
$$\sum_{k=3}^{\infty} \frac{x^{k-1}}{5^k}$$
3. Suppose that $\sum a_k$ is a series of positive terms that converges. Prove that $\sum \frac{1}{a_k}$ diverges. Is the converse true?
4. For what values of p is the given series convergent? Explain.
$$\sum_{k=2}^{\infty} \frac{1}{k(\ln k)(\ln \ln k)^p}$$