Each problem is worth 5 points. Clear and complete justification is required for full credit.

1. Find the sum of the series $\sum_{n=1}^{\infty} \left(\frac{-1}{3} \right)^n$.

2. Determine whether the series $\sum_{n=2}^{\infty} \frac{1}{n(\ln n)^2}$ converges or diverges.