Determine whether the following series converge or diverge. Be sure to write out your explanations carefully and clearly. Don’t forget you should name the test you are using in your explanation.

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

2. \( \sum_{n=1}^{\infty} \frac{n}{\sqrt{n^4 + 3n^8 + 1}} \)

3. \( \sum_{n=1}^{\infty} \frac{3^n + n}{4^n - 1} \)

4. \( \sum_{n=1}^{\infty} \frac{3^n n^2}{n!} \)

5. \( \sum_{n=1}^{\infty} \frac{2^n}{n^n} \)

6. \( \sum_{n=1}^{\infty} n^2 e^{-n^3} \)