Determine whether the following series converge or diverge, stating which convergence test you use.

1. $\sum_{n=3}^{\infty} \frac{1}{\ln(n)}$

2. $\sum_{n=2}^{\infty} \frac{1}{\sqrt{n(n-1)}}$

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

4. $\sum_{n=1}^{\infty} \frac{1}{ne^n}$

5. $\sum_{n=1}^{\infty} \left(\frac{1}{\pi}\right)^n$

6. Which test will help you determine if the series converges or diverges?

$$\sum_{k=1}^{\infty} \frac{5+k}{k!}$$

   (a) Integral test

   (b) Comparison Test

   (c) Ratio Test

   (d) Limit Comparison Test

7. In order to determine if the series below converges or diverges, the comparison test can be used. Decide which series provides the best comparison.

$$\sum_{k=1}^{\infty} \frac{\sqrt{k+1}}{k^2+1}$$

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

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

   (c) $\sum_{k=1}^{\infty} \frac{\sqrt{2k}}{k^2}$

   (d) $\sum_{k=1}^{\infty} \sqrt{k}$

8. Suppose we know that $0 \leq b_n \leq 1/n \leq a_n$ and that $0 \leq c_n leq 1/n^2 \leq d_n$ for all n.

   (a) Which of the series $\sum a_n$, $\sum b_n$, $\sum c_n$, and $\sum d_n$ definitely converge? Justify your answer.

   (b) Which of the series $\sum a_n$, $\sum b_n$, $\sum c_n$, and $\sum d_n$ definitely diverge? Justify your answer.