Math 141
Exam #3
Spring 2011

Name:

1. [15 pts.] Find the next two terms of the sequence $\{1, 3, 9, 27, 81, \ldots\}$, find a recurrence relation that generates the sequence (including the initial value of the index and the first term of the sequence), and then find an explicit formula for the nth term.

2. [10 pts.] Find the limit of the sequence $\left\{\left(1 + \frac{5}{n}\right)^n\right\}$

3. [10 pts.] Evaluate the geometric series $\sum_{k=2}^{\infty} \frac{1}{4^k}$, or state that it diverges.

4. [10 pts.] For the telescoping series $\sum_{k=1}^{\infty} \left(\frac{1}{k+2} - \frac{1}{k+3}\right)$, find a formula for the nth term of the sequence of partial sums $\{s_n\}$, then evaluate $\lim_{n\to\infty} s_n$ to obtain the value of the series.

5. [10 pts.] Use an appropriate test to show that the series $\sum_{k=1}^{\infty} \frac{k^3}{k^3 + 10}$ diverges.

6. [10 pts.] Use the Integral Test to determine whether the series $\sum_{k=1}^{\infty} ke^{-3k^2}$ converges or diverges.

7. [10 pts.] Use the Ratio Test to determine whether $\sum_{k=1}^{\infty} \frac{k^6}{k!}$ converges or diverges.

8. [10 pts.] Use the Root Test to determine whether $\sum_{k=1}^{\infty} \left(\frac{k+1}{2k}\right)^k$ converges or diverges.

9. [10 pts.] Use a comparison test to determine whether $\sum_{k=1}^{\infty} \frac{\sin(1/k)}{k^2}$ converges or diverges.

10. [10 pts.] Determine whether the alternating series $\sum_{k=2}^{\infty} (-1)^k \frac{k^2 - 1}{k^2 + 3}$ converges or diverges.