MATH 141
FALL 2015 NAME:
EXAM 3

1. [10 pts. each] Find the limit of the sequence, or explain why the limit does not exist.
   (a) $a_n = 2^n/3^{n+1}$
   (b) $a_n = \ln(n+1) - \ln(2n)$

2. [10 pts.] Evaluate the geometric series, if it converges: $\displaystyle\sum_{n=0}^{\infty} \frac{4^{n+1}}{5^n}$.

3. [10 pts.] For the telescoping series
$$\sum_{n=1}^{\infty}\left(\frac{1}{n+6} - \frac{1}{n+7}\right),$$
find a formula for the kth term of the sequence of partial sums $\{s_k\}$, then evaluate $\lim_{k\to\infty} s_k$ to obtain the value of the series.

4. [10 pts. each] Determine whether the series converges or diverges using one of the indicated tests.
   (a) Divergence or Integral Test: $\displaystyle\sum_{n=1}^{\infty} \frac{n}{\sqrt{n^2+25}}$
   (b) Divergence or Integral Test: $\displaystyle\sum_{n=1}^{\infty} ne^{-2n^2}$,
   (c) Ratio Test: $\displaystyle\sum_{n=1}^{\infty} \frac{2^n}{n^{99}}$
   (d) Root Test: $\displaystyle\sum_{n=1}^{\infty}\left(\frac{n^2+1}{2n^2+1}\right)^n$
   (e) Either comparison test: $\displaystyle\sum_{n=1}^{\infty} \frac{\sin^2 n}{n\sqrt{n}}$
   (f) Either comparison test: $\displaystyle\sum_{n=1}^{\infty} \frac{n^7}{n^9+3}$

5. [10 pts. each] Use the Alternating Series Test to show the series converges, or use another test to show it diverges.
   (a) $\displaystyle\sum_{n=2}^{\infty} \frac{(-1)^n}{n\ln^2 n}$
   (b) $\displaystyle\sum_{n=1}^{\infty}(-1)^n\left(1 - \frac{2}{n}\right)$