Math 141
Exam #2
Summer 2011

Name:

1. [10 pts. each] Evaluate each integral

   (a) $\displaystyle\int \frac{1}{x^2-2x-24}\,dx$

   (b) $\displaystyle\int \frac{x}{(x+3)^2}\,dx$

2. [10 pts. each] Evaluate each improper integral or state that it diverges.

   (a) $\displaystyle\int_2^\infty \frac{\sin(\pi/x)}{x^2}\,dx$

   (b) $\displaystyle\int_0^{16} \frac{1}{\sqrt[4]{x}}\,dx$

3. [5 pts. each] For the sequence $\{1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \ldots\}$ do the following.

   (a) Find the next two terms of the sequence.

   (b) Find a recurrence relation that generates the sequence.

   (c) Find an explicit formula for the general nth term of the sequence.

4. [10 pts. each] Find the limit of each sequence, or state that the limit does not exist.

   (a) $\left\{\dfrac{2n^{12}}{7n^{12}+4n^5}\right\}$

   (b) $a_n = (-1)^n \sqrt[n]{n}$

   (c) $\left\{\dfrac{\cos n}{2^n}\right\}$ (Use Squeeze Theorem)

5. [10 pts.] Evaluate the geometric series $\displaystyle\sum_{k=2}^{\infty} \frac{5}{2^k}$.

6. [10 pts.] For the telescoping series $\displaystyle\sum_{k=1}^{\infty}\left(\frac{1}{k+2}-\frac{1}{k+3}\right)$, 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.

7. [10 pts. each] Determine whether the series converges or diverges. The test(s) you are allowed to use are indicated in parentheses.

   (a) $\displaystyle\sum_{k=0}^{\infty} \frac{k}{99k+50}$, (Divergence Test or either Comparison Test)

   (b) $\displaystyle\sum_{k=1}^{\infty} \frac{k}{\sqrt{k^2+4}}$, (any test that works)

   (c) $\displaystyle\sum_{k=1}^{\infty} \frac{(k!)^2}{(2k)!}$, (Ratio Test)

   (d) $\displaystyle\sum_{k=1}^{\infty} \frac{k^2}{2^k}$, (Root Test)

   (e) $\displaystyle\sum_{k=1}^{\infty} \frac{k^2-1}{k^3+9}$, (either Comparison Test)

   (f) $\displaystyle\sum_{k=1}^{\infty} \frac{k^8}{k^{11}+3}$, (any test that works)