Name: _____

Complete the following problems to the best of your ability. Clearly number each question and write your name on each sheet of paper you turn in. Algebraic support must be shown to receive full credit (i.e. show work!). Answers should be exact unless otherwise specified.

1. (15 pts.) Determine whether each of the following **sequences** is convergent or divergent. If the sequence converges, identify the value of its limit.

(a) $\left\{\dfrac{n}{n^3+1}\right\}_{n=1}^{\infty}$

(b) $\left\{\dfrac{n^3}{n^3+1}\right\}_{n=1}^{\infty}$

(c) $\left\{\dfrac{n^{10}}{n^3+1}\right\}_{n=1}^{\infty}$

2. (15 pts.) Determine whether each of the following **series** is convergent or divergent.

(a) $\displaystyle\sum_{n=1}^{\infty}\frac{n}{n^3+1}$

(b) $\displaystyle\sum_{n=1}^{\infty}\frac{n^3}{n^3+1}$

(c) $\displaystyle\sum_{n=1}^{\infty}\frac{n^{10}}{n^3+1}$

3. (15 pts.) Explain why the series $\displaystyle\sum_{n=0}^{\infty}\frac{1}{\left(\sqrt{2}\right)^n}$ converges and find the value of its sum.

4. (10 pts.) Use the Integral Test to prove that the series $\displaystyle\sum_{n=2}^{\infty}\frac{1}{n\ln(n)}$ diverges.

5. (15 pts.) Consider the alternating series $\displaystyle\sum_{n=0}^{\infty}\frac{(-1)^n}{\ln(n)}$.

(a) Show that the series converges.

(b) What is the smallest positive integer, n, for which $|s-s_n|<0.1$?

6. (15 pts.) Determine the radius of convergence and interval of convergence of the power series $\displaystyle\sum_{n=0}^{\infty}\frac{(x-2)^n}{n+1}$.

7. (15 pts.) Find the Maclaurin series for the function $f(x)=e^{-x^2}$. What is its radius of convergence?

E.C. (10 pts.) Find a power series representation for the function $f(x)=\dfrac{1}{(1+x)^2}$. Identify its radius of convergence and interval of convergence.