NAME:

Rec. Instructor:

Math 221 – Analytic Geometry and Calculus 2

Exam 3, Summer 2013

In order to receive full credit (or any credit at all), answers **must be** justified. Put a box around your final answer so the grade knows what your solution is. Use exact numerical answers, **NOT** calculator-generated answers. Solutions do not need to be completely simplified in order to receive full credit. The point value of each problem appears in parenthesis.

(**20) Problem 1(a)** Compute the Maclaurin series for the function $f(x) = \frac{1}{1-x}$ and find its interval of convergence (show all of your work do not just write a memorized answer)

(10) (b) Use your answer in part (a) to compute the Maclaurin series for the function $f(x) = \frac{1}{1+x^2}$ and find its interval of convergence.

(10) (c) Use your answer in part (b) to compute the Maclaurin series for the function $f(x) = \tan^{-1}(x)$ and find its interval of convergence.

(13) Problem 2. Use the integral test (make sure you justify being able to use it) to decide whether the following series converges or diverges.

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

(5+5) Problem 4. For each of the following sequences decide whether it converges or diverges. If it converges, find the limit of the sequence.

(a) $\left\{\frac{n}{\sqrt{16n^2+n-35}}\right\}_{n=1}^{\infty}$

(b) $\left\{(1.0001)^n\right\}_{n=0}^{\infty}$

(20) Problem 3. Find the interval of convergence of the following power series (be sure to check the end points).

$$\sum_{n=0}^{\infty} \frac{(-3)^n x^n}{\sqrt{n+1}}$$

(7+7+7+6) Problem 5. For each of the following series determine if it converges or diverges. You **MUST** make sure to clearly state **which test** you are using and what **the conclusion** of that test is. (The integral test is not necessary for this problem.)

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

(b) $\displaystyle\sum_{n=0}^{\infty} \frac{4+2^n}{3^n}$

(c) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{\ln(n)^4}$ (hint: for all a>0 $\ln(n) \le n^a$ when n is large enough.)

(d) $\displaystyle\sum_{n=2}^{\infty} \frac{n^2}{4n^2-500n+12}$