Test 3, Calculus 2 Spring 13 **Name:**

To receive credit you MUST SHOW ALL YOUR WORK. Answers which are not supported by work will not be considered.

1. (6 pts) Show that the sequence $a_n = \frac{5^n}{n!}$ is eventually monotone.

2. (10 pts) Compute the exact value for each of the following:

(a) $\lim_{n\to+\infty} 3(7)^{-n+2}$ (b) $\sum_{n=5}^{\infty} 3(7)^{-n+2}$

3. (10 pts) State and prove the k-the term divergence test for series.

4. (24 pts) For each of the following series, determine if the series is divergent, conditionally convergent, or absolutely convergent. Justify your answer: very little credit will be given just for a guess. (8 pts each)

(a) $\frac{1}{3} + \frac{2}{5} + \frac{3}{7} + \frac{4}{9} + \frac{5}{11} + \ ...$

(b) $\sum_{n=1}^{\infty} (-1)^n \frac{1}{n^2 + n}$

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

5. (10 pts) Using any method, but showing your work, find the Maclaurin series (Taylor series at $x_0 = 0$) for the function $f(x) = \ln(1 + x)$.

6. (10 pts) Use Taylor/Maclaurin polynomials for e^x to approximate $e^{-0.2}$ with an error smaller than 10^{-6}.

7. (20 pts) Compute the interval of convergence for each series. Full justification is required. Be sure to investigate the end-points if necessary.

(a) $\displaystyle\sum_{k=1}^{\infty} \frac{5(x-2)^k}{k}$

(b) $\displaystyle\sum_{k=1}^{\infty} \frac{(5x)^k}{k!}$

8. (10 pts) For each of the power series in the problem above, determine the function that they represent.