Name: _____ _____ / **25**

30 minutes maximum. No aids (book, calculator, etc.) are permitted. **Show all work** and use proper notation for full credit. Answers should be in reasonably-simplified form. 25 points possible.

1. (12 points) Use either the ratio test or the root test as appropriate to determine whether the series converges or diverges or state that the test is inconclusive. State the test that you are using.

   (a) $\displaystyle\sum_{n=1}^{\infty} \frac{5^n}{n!}$

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

2. (4 points) For which p-values does the series $\displaystyle\sum_{n=1}^{\infty} \frac{n^p}{2^n}$ converge? Justify your conclusion.

3. (9 points) Consider the series $\sum_{n=1}^{\infty} \frac{x^n}{n}$.

   (a) Find R, the radius of convergence of the series.

   (b) Determine the interval of convergence of the series. (Make sure to check any endpoints, if they exist.)

Extra Credit (1 point) Suppose the series $\sum_{n=0}^{\infty} a_n(x-3)^n$ converges at $x=2$. Can you conclude that the series converges at $x=3.9$? Justify your conclusion.