For more information and answers or partial solutions, see the class homework blog at https://openlab.citytech.cuny.edu/shavermat1575fall2017/

Topics for this test: Please note that you also need to know the methods covered in the previous tests!

- Series, partial sums, and the theorems about convergence/divergence
  - Integral comparison
  - (Direct) comparison
  - Limit comparison
  - the Alternating Series Test
  - the Ratio Test
  - the Root Test
- Approximating the sum and estimating the error for an alternating series
- Power series and their intervals of convergence
- Taylor series

Instructions: These problems are for you to use to test yourself, **after** you have practiced with the routine homework assignments, to see how ready you are for Test 3. They are not meant as a substitute for regular and diligent practice!
Do the following problems as if you were taking a test: without notes or textbook, and give yourself a time limit as stated at the start of each self-test. At the end of that time, check your answers against the answers posted on the blog. Then review as needed from the relevant sections, before you re-test.

Self-Test 1: allow 50 minutes.

1) a) Show that the series $\sum_{n=0}^{\infty} \frac{(-1)^{n+1}}{2n+1}$ converges.
   b) Is the convergence conditional or absolute? Explain.
   c) Estimate the error when the series $\sum_{n=0}^{\infty} \frac{(-1)^{n+1}}{2n+1}$ is approximated by its first 50 terms.
   d) Estimate the number of terms we would need to use if the error must be no more than 0.000005
2) Find the interval of convergence for the power series $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{(x-2)^n}{n}$
3) Determine whether the series converges or diverges: $\sum_{n=2}^{\infty} \frac{1}{(\ln(n))^n}$
4) Use a Taylor series you already know to find the Maclaurin series for e^{-x^2}
5) Find the Taylor series centered at 2 for the function $f(x) = \frac{1}{x}$. What is its radius of convergence?

Self-Test 2: allow 50 minutes.

1) a) Show that the series $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^4}$ converges.

   b) Is the convergence conditional or absolute? Explain.

   c) Estimate the error when the series $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^4}$ is approximated by its first 8 terms.

   d) Estimate the number of terms we would need to use if the error must be no more than 0.00005

2) Find the interval of convergence for the power series $\sum_{n=1}^{\infty} \frac{(x-3)^n}{n^2}$

3) Determine whether the series converges or diverges: $\sum_{n=1}^{\infty} \frac{2^{n-1}}{n^n}$

4) Use a Taylor series you already know to find the Maclaurin series for $x^2 e^{-x}$

5) Find the Maclaurin series for the function $f(x) = \frac{1}{1-3x}$. What is its radius of convergence?