Math 1B Practice Midterm 2, July 27 2011

Most of the 7 problems will be very similar to those on the practice midterms you already have. Here are some others that are similar to those that will be on the midterm:

1. Determine whether the following sequences/series converge (C) or diverge (D). You will lose 2 points for each incorrect answer and gain 2 points for each correct answer, so leave blank if you have no idea. No justification necessary.

   (a) The series $\sum_{n=1}^{\infty} \frac{1}{n^{1.2}}$;

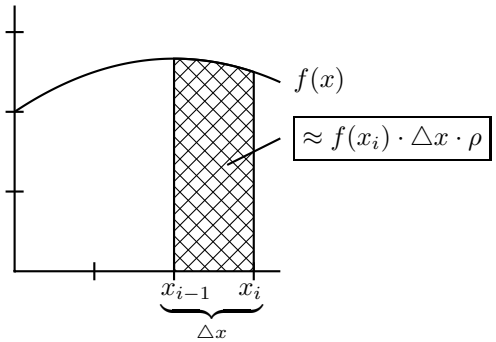
   (b) The sequence $\frac{n}{n-\ln n}$;

   (c) The series $\sum_{n=1}^{\infty} \frac{n^n}{n!}$;

   (d) The sequence $(\sin 2n)^n/n$;

   (e) The series $\sum_{n=1}^{\infty} \frac{2^n n^3}{5^n n^{10}}$.

2. To find the (horizontal) moment of a body, we can break it up into pieces, find the moment of each piece, and then add them all together to get the total moment. The (horizontal) moment of a particle is the mass of the particle times the horizontal distance of the particle from the y-axis ($x = 0$). The moment of a piece is then approximated by the mass of the piece times the horizontal distance of the piece from the y-axis. Consider the region bounded by $y = 0$ below and $y = f(x)$ above, from $x = a$ to $x = b$. We can calculate the mass of a piece as the area of the piece times its density, ρ.



   This mass is then multiplied by the approximate x-distance, x_i, to get the moment of this piece. Using this fact, write down a sum that approximates the total moment of the region. You do not need to derive it from the approximation you wrote down. Then if the region has area A (and so has mass $\rho \cdot A$), write down the horizontal coordinate of the center of mass of the region.

3. In the proof of the Ratio Test, we are given a series $\sum_{n=1}^{\infty} a_n$, and we construct a geometric series with a particular r-value. Explain how r is related to the numbers 1 and $L = \lim_{n\to\infty} |\frac{a_{n+1}}{a_n}|$. Say when a geometric series converges and when it diverges, and explain how this fact is used in the Ratio Test.