Calculus II
Spreadsheets, Definite Integrals, and Left- and Right-hand Sums
Due Monday January 16, 2011

Purpose

1. To gain a deeper understanding of left- and right-hand sums and to learn how to approximate a definite integral using a spreadsheet. (It is not unusual to have to use a computer to evaluate an integral, so this is more than just an idle exercise.)

2. To gain experience working with spreadsheets, especially entering formulas. Using spreadsheets is an incredibly valuable skill in science, math, and in life in general.

General Instructions

- You can do this exercise in pairs if you want. If you do, you should be sure to take turns typing, so you each gain direct experience working with the spreadsheet.
- Only hand in one assignment per duo.
- This is not meant to be an ordeal. If it takes much longer than an hour, stop. We can go over it when I get back if needed.
- I assume you have access to a spreadsheet program of some sort. Openoffice Calc is a good free option, as is google spreadsheets. (To find google spreadsheets, go to google docs and choose spreadsheet. You'll need a google account.)

Formulas and Spreadsheets

- In addition to entering numbers into spreadsheets, it is possible to enter formulas. This is incredibly useful and handy.

- It is not hard. To indicate that what you're typing into the cell is a formula, begin with an "=".

- Refer to the values in other cells by typing $ followed by the cell name.

- For example, a formula that takes the value in cell A2 and adds it to the value of the cell in B3 would be: `=$A2+$B3`.

- If this isn't clear, ask someone who has experience with formulas and spreadsheets to show you.

Initial Example

We will approximate the definite integral we looked at in class on Friday:

$$\int_1^3 x^2\,dx\ . \tag{1}$$

Let's use $\Delta t = 0.5$. The LH sum is:

$$\text{LH sum } = (1)^2\Delta t + (1.5)^2\Delta t + (2.0)^2\Delta t + (2.5)^2\Delta t\ . \tag{2}$$

Evaluating this one gets 6.75. Similarly, the RH sum is:

$$\text{RH sum } = (1.5)^2\Delta t + (2.0)^2\Delta t + (2.5)^2\Delta t + (3.0)^2\Delta t\ . \tag{3}$$

The RH sum evaluates to 10.75.

I have prepared a sample spreadsheet that does this calculation for you. Take a look at the spreadsheet and see how it works. (There are many ways to accomplish this task. If another way seems easier to you, go for it.) You can download the sample spreadsheet from the homework page on the course website. You can upload the excel document to google docs if you want.

Stuff to do:

1. Modify the spreadsheet I sent you to compute left and right hand sums for $\Delta t = 0.25$.
2. Modify the spreadsheet I sent you to compute left and right hand sums for $\Delta t = 0.1$.
3. Use a spreadsheet to estimate:
$$\int_2^{10} e^{-x}\,dx\ . \tag{4}$$
4. Use a spreadsheet to estimate:
$$\int_{-2}^{2} \sin(x)\,dx\ . \tag{5}$$