MATH 104 ACTIVE LEARNING
GUIDELINES FOR PRE-CLASS PREP

1. Reading the textbook

Mathematics textbooks including our own, Thomas' Calculus, are **NOT** meant to be read sequentially line by line as you might read a novel or a textbook in some other field like biology. Instead, you should do the following:

(1) **Skim the section:** In 1-2 minutes get a sense of what the section is about.
(2) **Identify the main results and techniques:** What results or concepts are boxed in the text? What techniques does the section cover? Example: In section 6.1, there are three techniques covered, namely computing the volume by slicing the solid via parallel planes, computing the volume of a solid of revolution by the disk method, and computing the volume of a solid of revolution by the washer method. What unites the three techniques and constitutes the reason they were placed in the same section is the fact that you are slicing perpendicular to the axis of symmetry of the solid whose volume you are trying to compute. For each of these three techniques, problems might require you to slice vertically or horizontally. For the first technique of slicing via parallel planes, problems get set up based on what the cross section looks like (square, rectangle, circle, etc.). You can get all this information by looking at the titles of the subsections and quickly skimming the section.
(3) **Correlate examples:** Read the statement of each of the examples in the section. Figure out what technique or result it is an example of. Don't read the details of the examples yet. These first three steps allowed you to figure out the structure of the material in the section. Now you are prepared to absorb the details.
(4) **Understand the boxed statements:** Spend some time staring at each boxed definition or result. What does it say? Reading a mathematical statement is a bit like reading a sentence in a foreign language. First you check you know the words,

and then you try to put them together to obtain the meaning of the sentence. Do you recognize all words/terms in the statement? If not, look at the index of your textbook, find the word/term you don't know in the text, and read its definition. Now you understand the terms. Read the box statement again. Try to restate it in your own words. Can you visualize what it says? Why or why not? If not, think about what makes it feel confusing. Can you give an example when the box statement applies? What about an example when it does not apply? Now you are ready to understand the examples that pertain to this statement.

(5) **Understand the examples:** Read the statement of the first example corresponding to the boxed statement you just studied. Think about how you might be able to apply the result you just read. Try to see whether you can set up the problem before you glance at the solution the book provides. Did you get stuck anywhere setting it up? Did you set it up incorrectly? If so, look at the explanation the book provides. Now you know how to set up the problem. Try doing the computation without looking at the worked out solution. Did you get the right answer? If not, where did you make a mistake? Can you avoid the same computation error in the future? In the same manner, go through each example in the book that pertains to the boxed statement you studied. Next, go to the subsequent boxed statement and repeat steps (4) and (5).

(6) **Read the prose:** Congratulations! You've worked through the boxed statements and the examples. That's the meat of the section. The prose in between simply connects the dots. Skim through it reading in more detail whatever you find interesting or illuminating.

(7) **Questions/comments on Canvas:** In an ideal world, you'd do steps (1)-(6) and understand everything, but math is sometimes difficult and sometimes you just don't have enough space in your schedule to devote all the time you might need for steps (1)-(6) to work perfectly. Write on Canvas all your questions and comments pertaining to what you didn't/did understand, what you found easy/hard, etc. Feel free to answer your classmates' questions, if you can, or give them an intuitive description that helped you figure things out. In my mini-lecture in class, we'll cover whatever is still fuzzy or confusing, and then we'll be ready to work in groups!

2. Nakia Rimmer's videos and lecture notes

Nakia Rimmer has video lectures covering the same material we will be going through. They can be found at

`http://www.math.upenn.edu/ugrad/calculus-videos/pennmathvideos.html`.

Many students find they prefer watching videos to reading the book. For each section we cover, you will be provided with the pdf of Nakia's notes that act as the transcript of each of his videos. The fastest study method might be scanning Nakia's notes first to see how much of the section you already understand and then watching only the portions of the video corresponding to the parts that you don't understand. To go through Nakia's notes, follow the same procedure as outlined for reading the book. Note that sometimes Nakia's videos don't cover all the material in the book, so check the book to make sure you've prepared everything before class.