Assignment for Day 6 – May 2, 2007

Read §3.4–3.8, pp. 122–165. Also take a look at the Appendix to Chapter 3, in order to get a sense of what is involved in rigorously proving what has been asserted about the number *e* and continuous compounding.

Study Questions

1. Summarize the views held by Alpha, Beta, Gamma, and Delta in the dialogue in §3.4. Do you find that any one of these views is particularly close to your own? What would these mathematicians say about the presentation of area by Exhaustion and Compression that is given in Chapter 2? Would area as a concept seem controversial to them? *Explain*

   What is the response of Author to each of the views of the four other mathematicians? Do you find yourself taking sides in any of these differences? *Why/why not?*

2. Consider the presentation of the concept of infinite series on pages 123–124. Is this close to the presentation of this concept that you were given when you were first introduced to infinite series? If so, what is particularly difficult or obscure about it? Does it seem any clearer now that you have studied the notion of infinite processes more closely? Would you change anything about the presentation on pages 123-4 if you were writing an introduction to these concepts for beginning students?
3. When we first considered infinite walks in Chapter 1, we were, in effect, beginning to study infinite series that have positive terms. In the language of infinite series, we learned there that:
   a. A series of positive terms cannot converge unless the sequence of terms converges to 0.
   b. Even if the sequence of terms converges to 0, the series may not converge.

   In terms of the examples of walks in Chapter 1 and the propositions proved there, tell in detail how you learned these two facts there.

   The moral of the story in Chapter 1 was that in order for a series of positive terms to converge, we have to know something special about the pattern of its terms and how they get smaller and smaller. Now describe what you've learned in this direction in §3.5.

4. Give an outline of Proposition 2 that captures the "nub" of what we need to know about the pattern of how the terms of a series get smaller in order to conclude that a series converges. Then tell how the Ratio Test (presented in every introductory calculus book) is proved from Proposition 2. Can you summarize the "nub" of this proof?

5. In relation to §3.6, try to recall other situations in your mathematics education (starting in grade school) in which important technical terms were used in a metaphorical way. What were they? How confusing was this for students? Please add one or two more "confusing metaphors in mathematics education" of your own.

6. In terms of your own experience of this material and our classroom discussions, what is your answer to the question: "Is the sum of an infinite series a sum?" If you were teaching a high school honors calculus class now and were going to introduce the topic of infinite series in the next few weeks, how would you describe what an infinite series is; what would you say or do about the issue of the term *Sum* of an infinite series?

7. Imagine that you are planning to give a brief presentation to a high school honors calculus class on *The Mysteries of Continuous Compounding and the Number e*. What would you say? What are the main ideas here?

8. After reading §3.7 on Continuously Compounded Interest, what are your *own* answers to the questions that are raised at the end of the Dialogue in §3.4 about new math concepts: Is this "Real?" Is there anything new here? Is continuously compounded interest, really "compounded?" In what sense might one say that continuously compounded interest is a limiting case of compounded interest? Does this help in any way?

E-Post Questions for Day 6

In your E-Post, you should give your responses to the following question:

> The table on p.164 suggests an analogy between the walks in Chapter 1 and infinite series, as we have studied them in Chapter 3. Does this analogy feel right to you—or not? What does this analogy say in the case of Wally's Walk? Is this analogy helpful? Does the analogy break down in any way?

Weekly Writing Assignment for Day 6

The concept of continuously compounded interest was introduced here because it seems to me analogous to terms like area of a circle, tangent to a curve, instantaneous speed of a moving object and sum of an infinite series. To what extent is this a "true" and convincing analogy for you? In what ways, if any, does this analogy break down? The counterpart to the question in §3.4 is: Is continuous compounding a form of compounding? What do you think? Is continuous compounding "real?"