*Assignment for* **Day 10 – May 30, 2007**

Read §5.4, pp. 257–266.

Study Questions

1. The word *integral* is used in two very distinct ways in calculus: the *definite* integral and the *indefinite* integral. This week's reading, about the Fundamental Theorem of Calculus, aims to connect these two kinds of integral. In order to appreciate and understand what is going on, you first have to grasp how these two kinds of integral are *different*. So, before getting too deeply involved in this week's reading, you should consult an elementary calculus book (or the web) in order to recall what the meanings of these two terms, definite integral and indefinite integral, are and how they are related.

2. Here is an operation on the set of rational numbers (fractions): For any rational number r, multiply it by $3/4$. Is there a reciprocal to this operation; if so, what is it? Here is another operation on the set of rational numbers: For any rational number r, let $[r]$ be the smallest integer larger than r. Is there a reciprocal to this operation; if so, what is it?

3. The up-and-down graph shown to the right is of the function $f(x)$. We define a new function $A(p)$ from this function, using the area under its graph in the same way as is done for the function $f(x)$ on p.261. Sketch the graph of this new function $A(p)$. Sketch the graph of the function you would get by measuring the slopes of the tangents to the graph of this new function $A(p)$. Compare this last graph to the graph of the function $f(x)$ we began with.
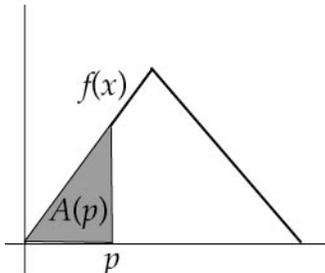
4. Suppose we are given the function defined by the formula $g(x) = 5x$ for $x = 2$ to $x = 6$. What does the Mean Value Theorem say about this function on this interval? Suppose that, instead of the function $g(x)$ just given, you are asked about the function $R(x)$ given by $R(x) = x^2$ for $x = 0$ to $x = 5$. What does the Mean Value Theorem say in this case?

5. You should be able to give a clear and simple presentation of why the Mean Value Theorem is true.

6. Here are two statements using the term integral:
    A. The operation of finding the anti-derivative (which is the same as indefinite integral) is the reciprocal to the operation of finding the derivative.

   B.   The operation of constructing the area-under-the graph function is the reciprocal to the operation of constructing the graph of slopes of tangents.

One of these two statements is true by definition. The other is the conclusion of the Fundamental Theorem of Calculus.   Which is which?

7.   Imagine that you are about to give a presentation to a *very* strong high school calculus class of what the Fundamental Theorem of Calculus says and why its true. What would you say? *See the Weekly Writing Assignment below.*

E-Post Questions for Day 10

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

   Imagine that you are preparing to make the presentation referred to in Study Question 7 above. What will be the hardest part for the students to understand? Do you have any special ideas or strategies for helping them understand this part? If so, what are they?

Weekly Writing Assignment for Day 10

Answer Study Question 7 above.