Calculus I — Fall 2015 — Review for third exam

The exam covers sections 3.4, 3.5, 3.7, 3.9, 4.1, 4.2, 4.3, 4.4, and 4.5 of the text. The relevant homework assignments are Assignments 8, 9, 10, and 11.

On this exam, I might ask for the definition of the definite integral as a limit of Riemann sums. This definition is given in the box on page 306; I gave a shorter version in class. You can give a shorter definition in your own words, but your definition should at least indicate the meaning of all the symbols you use. In particular you should explain, at least briefly, the meaning of the symbols x_i and Δx.

For the exam, you should also have memorized the formulas for antiderivatives in the table on page 331.

Here is a brief guide to the sections of the text covered on the exam. The page numbers refer to the 8th edition.

3.4. Review the entire section, except you can skip the part titled "Infinite limits at infinity" on pages 237 to 241.

3.5. Review the entire section, except you do not need to know about "slant asymptotes".

3.7. Review the entire section, except you can skip the part titled "Applications to business and economics" on pages 263–264.

The best way to study this section is to try a couple of problems from the end of this section that haven't been assigned yet, trying to get a feel for the procedure outlined on page 258.

3.9. Review the entire section. Notice the table of antiderivatives on page 279 appears again, in different form, on page 331.

4.1. The whole section is worth reading, because it explains why we define definite integrals the way we do. (Definite integrals are not mentioned in this section, but notice that the "area" defined in the box at the top of page 299 is defined in the same way as the definite integral.)

As far as problems on the exam are concerned, I might ask a problem like Example 1 in this section, but you do not need to know how to take limits as in Example 2.

Remember to distinguish clearly between Riemann sums and definite integrals. A Riemann sum is obtained by taking a specific value of n, say $n = 100$, and computing $\displaystyle\sum_{i=1}^{n} f(x_i)\Delta x$. A definite integral, on the other hand, is not a Riemann sum, but is rather a number obtained by taking the limit of Riemann sums as $n \to \infty$.

4.2. Review the first three pages of the section, and the part titled "Properties of the definite integral" on pages 313 – 316. You can skip the remainder of the section.

4.3. Review the entire section. You should know both parts of the Fundamental Theorem of Calculus (see the box on page 326).

4.4. The only new thing in this section is the notation $\int f(x)\ dx$ used for antiderivatives. We call $\int f(x)\ dx$ an "indefinite integral" to distinguish it from the definite integral $\int_a^b f(x)\ dx$. For example, $\int x^2\ dx$ denotes the function $\frac{x^3}{3} + C$, where C is a constant, while $\int_1^5 x^2\ dx$ denotes the number $\frac{5^3}{3} - \frac{1^3}{3}$.

Apart from knowing what the notation $\int f(x)\ dx$ means, and learning the antiderivatives in the table on p. 331, you don't need to read the rest of the section.

4.5. Review from the beginning of the section through Example 5. (The remainder of the section, on definite integrals by substitution, will be covered on the final exam.)