Math 105, Benedetto

What you need to know for Exam 2

You should know Section 1.8 on Continuity and the first parts of Chapter 2; specifically Section 2.1-2.6, excluding 2.4 on Trig. functions). The test will not explicitly cover material from Chapter 1, but of course it will be assumed that you understand that material. (For example, you still need to know how to work with limits.) The following is a list of most of the topics covered. **THIS IS NOT A COMPREHENSIVE LIST, BUT MERELY AN AID.** Remember, no calculators in any exams.

- 1.8: Continuity: at a number a, or on an interval I. Know both the official definition ($\lim_{x \to a} f(x) = f(a)$) and the intuitive idea (you can draw it without lifting your pencil off the paper). The three ways continuity can fail ($f(a)$ not defined; or $\lim_{x \to a} f(x)$ not defined; or both defined, but not equal). Continuity from the right or left. Theorems 4–9 (for continuity of sums, differences, products, and quotients, not to mention polynomials, rational functions, trig functions, and root functions, as well as compositions).

- 2.1: Limit definition of derivatives. (We've stuck to box 4 on page 107; just don't mix-and-match parts of one with the other.) Computing derivatives with the limit definition. Derivatives as slopes of tangent lines or instantaneous velocities or rates of change. Know how to compute derivatives using the **limit definition of the derivative**. What is it?

- 2.2: The derivative as a function. Differentiability. How can differentiability fail? Differentiable implies continuous, but not necessarily the other way around. The graph of f' in relation to the graph of f. Higher derivatives.

- 2.3: Differentiation Rules: Sum, Difference, Constant Multiple, Product, Quotient, Power. Memorize them and Know how to use them.

- 2.5: Chain rule. Know it well!! Be able to compute derivatives involving both chain rule and quotient/product rules, paying attention to the order. Place parentheses carefully!

- 2.6: Implicit differentiation. To find the tangent line to a curve described by some equation involving x and y, we think of y as a function of x, without knowing the actual formula for $y = f(x)$ (hence, an implicit, rather than explicit, function). So if we differentiate with respect to x, we must remember that y is a function of x and use the chain rule (or product rule, or quotient rule) when appropriate.

Some Things You Don't Need to Know

- y'' in implicit differentiation (end of Section 2.6) or $\dfrac{dx}{dy}$ computations.

- Derivatives involving Trigonometric functions.

Tips

- Know how to compute derivatives both ways, using the limit definition of the derivative and the differentiation rules.

- Know how to compute the equation of a tangent line. you need two things: a point and the specific slope at that point. You can use point-slope form or slope-intercept form.

- Read the directions twice. Follow carefully if the question asks you to simplify your answer.

- $\dfrac{d}{dx}$ is an instruction to "take the derivative", whereas $\dfrac{dy}{dx}$ is the derivative of y with respect to x.

- Know your differentiation rules quickly! Efficiency is key here.

- If any of the problems in Sections 2.3, or 2.5 gave you trouble, make sure you have them cleared up; those problems will be the *easier* ones on the exam.

- Implicit differentiation can also be tricky. Besides the fact that it comes up in future related rates problems, you also need to be able to recognize when you need to use it. Anytime you run into a y chunk in an implicitly defined equation, you need to use the Chain Rule on that term. y must be investigated by the derivative operator as well.

- Most importantly, be clear and neat on your answer work. People usually score higher when the work is easy to see and grade. Don't leave any guessing, mind-reading, or searching to the grader.

- Any time you can double check your work, please do that!