MATH 211, Section C — Review for EXAM I — Friday, 9/20/2002

Professor John Beachy — **Bring a valid picture I.D.**

The exam will cover Sections 1.1–1.5 and 2.1–2.5. Sections 2.2, 2.4, and 2.5 are the most important and will have the most emphasis on the test. In studying you should go back over the textbook carefully, review all of the homework problems, and then go over your quizzes. As the last step in studying you can go over the list of sample test questions at the bottom of this sheet. Most test questions will be similar to homework problems in the text, so be sure you understand how to solve all of the problems on the list of assigned homework from the textbook. You might also be asked to state a definition or formula, such as the definition of the derivative, the quadratic formula, or the power rule for derivatives.

Chapter 2

Section 2.1: Review the definition of a limit on the bottom of page 97, and the definition of a continuous function on page 104. The point is that the limit of a continuous function $f(x)$ at $x = a$ is $f(a)$, and so for any continuous function you get the limit by just substituting. In particular, to find the limit as $x \to a$ of a polynomial, just substitute a. This works for a rational function too, provided substituting a into the denominator does not lead to division by zero. (One of the most useful facts is that a rational function is continuous everywhere it is defined.)

Section 2.2: Carefully review all of the examples. The focus here is on finding limits of rational functions, so you should go over all of the homework problems in this section.

Section 2.3: I view this section as preparation for Section 2.4, both in understanding the concept of an average rate of growth and in practicing your algebra.

Section 2.4: You must know the limit definition of a derivative (see page 128), and how to use it:

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} \qquad \text{(provided the limit exists).}$$

For the function $f(x)$, the slope of the graph of $y = f(x)$ at the point (x, y) is given by the derivative $f'(x)$. This slope is the same as the slope of the line tangent to the graph at (x, y).

The simplest case is that of a straight line $f(x) = mx + b$, since then the slope is $f'(x) = m$, for all possible values of x. The power rule is used in more complicated cases: If $f(x) = x^n$, then $f'(x) = nx^{n-1}$.

Section 2.5: The notation $\dfrac{dy}{dx}$ is also used for the derivative of $y = f(x)$. With this notation, the power rule is $\dfrac{d}{dx}(x^n) = nx^{n-1}$. To use the power rule for more complicated functions, we need to combine it with two more rules (see pages 142–144): $\dfrac{d}{dx}[c \cdot f(x)] = cf'(x)$ and $\dfrac{d}{dx}[f(x) + g(x)] = f'(x) + g'(x)$.

To find the tangent line to the graph of $y = f(x)$ at the point (a, b), use the point-slope form of the line: $y = m(x - a) + b$. (Note: you can leave your answer in this form.) You will be given a, and possibly b (or you might need to calculate $b = f(a)$). Then you need to find the slope, which is given by $m = f'(a)$.

Chapter 1

Sections 1.1 and 1.2: This is review; you don't need to study compound interest.

Section 1.3: In finding the domain of a function, you are asking for the numbers for which the formula makes sense. When a formula doesn't make sense for a number, it is most often because of a zero in the denominator or the square root of a negative number. These are the same problems that would cause an error message on a calculator.

Section 1.4: The *point-slope* form of a line, $y = m(x - a) + b$, gives the equation of the line through the point (a, b) with slope m. The *slope-intercept* form of a line, $y = mx + b$, is a special case of the first form, and gives the equation of the line through the point $(0, b)$ with slope m. The number b is called the y-intercept of the line. To find the equation of the line through two given points, first find the slope, and then use the point-slope form.

Section 1.5: You need to know how to graph some basic functions by hand, since you are not allowed to use a calculator. Some important functions: linear functions (see Section 1.4); quadratic functions $y = ax^2 + bx + c$ (see page 56); $f(x) = x^3$ (see page 60); $f(x) = 1/x$ (see page 63); the absolute value function (see page 66).

The vertex of a parabola can be found by using algebra (see pages 56-58), but it is easier to use calculus. For $f(x) = ax^2 + bx + c$ we can set the derivative $f'(x) = 2ax + b$ equal to zero, getting $x = -b/2a$.

Some sample test questions: p.27 #23,46; p.38 #37,45; p.51 #19,21,25,27; p.71 #3,11,19,21,39,43; p.113 #9–12,19–22,27–30; p.124 #27,29,31,33; p.137 #11,13,15,16,17,21; p.148 #13,19,33,37,41,47,55,71,77.