This outcomes list summarizes what skills and knowledge you should have reviewed and/or acquired so far this quarter, and what sort of problems to expect on Exam 2. The problems here are representative, although we do not guarantee that the problems on the exam will look exactly like the ones here. Most are from homework problems assigned so far and some are extra problems from the book. You should, of course, also review the problems assigned on the syllabus.

**Exam 2 will cover sections 1.3, 1.5, 1.6, 2.1, 2.2**

**Chapter 1: Introduction to limits.** In this chapter, we learn how to do the fundamental calculations with limits that are required for chapter 2, where it is used to define and calculate the derivative.

1.3 Be able to compute limits at infinity. Understand that the symbol $\frac{\infty}{\infty}$ does NOT mean the number 1; it indicates an ambiguous expression which has to be evaluated using the techniques described in this section. Know how to take limits of rational functions. Know how to use the rationalization trick to handle expressions with radicals.

In addition to the homework problems assigned for this section, look at (all references to Section 1.3):

Examples 10, 11; problems 61, 62 (Equation 7 of this chapter is worth memorizing)

1.5 Understand the informal meaning of continuity. Understand the intermediate value theorem. Be able to check if a function has a removable singularity or not. Be able to check continuity of a function over an interval, including checking this property at the end points of the interval.

In addition to the homework problems assigned for this section, look at (all references to Section 1.5):

Example 2, 4; problems 35, 36. 31 is a regularly assigned problem, but is particularly good at illustrating concepts from this section.

1.6 Know, and be able to use, the most important limits described in this section: the equations from theorem 1.6.5.

In addition to the homework problems assigned for this section, look at (all references to Section 1.6):

Example 4; Regular problems 54, 56; (continued on next page)
2.1 Be able to compute average rates of changes, given numerical data or an algebraic description of the functional relation of the dependent and independent variables. Be able to compute slopes of secant lines for graphs of functions. Using a limiting process, find slopes of tangent lines for graphs of functions (in section 2.2, you see that this is the same as computing the derivative).

In addition to the homework problems assigned for this section, look at (all references to Section 2.1):

Example 4, 5, 6; Regular problems 24, 26, 28

2.2 Know the fundamental definition of the derivative, in its equivalent forms. Know that the geometric interpretation of the derivative is the slope of the tangent line; and that its interpretation in physics is as the instantaneous velocity. Given the graph of a function, be able to sketch the graph of its derivative function. Know, in particular, how to recognize horizontal tangent lines, vertical tangent lines, and how that affects the graph of the derivative.

In addition to the homework problems assigned for this section, look at (all references to Section 2.2):

Example 2; Regular problems 26, 32.

The material for Exam 2 ends here

Exam 1 will cover sections 0.1, 0.2, 0.4, Appendix B, 0.5, 1.1, 1.2

Chapter 0: Pre-calculus fundamentals. In this chapter we quickly review the knowledge we expect students to have as we approach the rest of the course.

0.1 Define functions and determine when a relation among quantities constitutes a function, i.e., by the vertical line test. Given a function, determine its domain and range. Understand how algebraic operations affect domains and range.

In addition to the homework problems assigned for this section, look at (all references to Section 0.1):

Examples 6, 7; Problems 24, 27, 36
**0.2 Define** operations on functions, such as addition of functions, multiplication, and composition. Be able to find the domain of a composition.

In addition to the homework problems assigned for this section, look at (all references to Section 0.2):

Examples 7, 8; Problems 52, 54, 68

**0.4 Given** a function, determine whether it has an inverse and, if so, what this inverse is. Apply be able to discuss the range and domain of the function and its inverse. Relate the graph of a function and its inverse.

In addition to the homework problems assigned for this section, look at (all references to Section 0.4):

Example 6; Problems 25, 28.

**0.5 Describe** what is meant by exponential growth or decay, and relate these to exponential functions $b^x$ and $b^{-x}$. Relate exponentiation to logarithms, especially the natural log. State and use the basic properties of exponents and logs that are useful for calculation.

In addition to the homework problems assigned for this section, look at (all references to Section 0.5):

Example 4; Problems 26, 28

**Appendix B. You** should know the definition of the auxiliary functions sec, cosec, tan, and cotan, in terms of sin and cos. You should know, and be able to use, the basic trig identity $\sin^2(x) + \cos^2(x) = 1$, as well as the sin and cos addition formulas. You should know the sin and cos of the standard angles $\frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}$, as well as related angles in the different quadrants.

In addition to the homework problems assigned for this section, look at (all references to Appendix B):

Example 6; Problems 7, 13, 34.

**Chapter 1: The Limit.** The limit is the basic object defining calculus. In this chapter we define the limit and develop techniques for finding limits of various functions.
1.1 Calculate the limit of a function $f$ of a variable $x$, as $x$ approaches some finite value $c$. Determine when such a limit does not exist, as a one-sided or two-sided limit. In either case, describe the behavior of $f$ in the vicinity of such a point. Include an understanding of what is meant by increase or decrease without bound in the vicinity of such a point, or a vertical asymptote.

In addition to the homework problems assigned for this section, look at (all references to Section 1.1):

Problem 8

1.2 Discuss how the limit interacts with basic arithmetic operations such as addition, multiplication, and division. Take limits of functions involving especially quotients or radicals; define some indeterminate forms.

In addition to the homework problems assigned for this section, look at (all references to Section 1.2):

Examples 9, 10; Problems 38, 40