Instructions. Exam 1 covers sections 2.1 - 2.3, 2.5 - 2.8, 3.1 - 3.8 in the textbook. Any material covered in Lectures 1 - 8, HW 1 - 8, and Worksheet 1 - 8 may appear on the exam. You should be able to demonstrate the following skills on the exam.

- Precisely state any definition or named theorem given in lecture. For Exam 1, see the list “Exam 1 Definitions and Theorems” found on the class webpage. (For Exam 2 and 3, you will need to create your own list when reviewing the lecture notes).

- Compute the \( \lim_{x \to a} f(x) \) using techniques covered in lecture, discussion and homework. These include combinations of algebraic and graphical methods. You will need to know graphs of basic functions such as the logarithmic, root, exponential, power, reciprocal and trigonometric functions to answer some of these questions.

- If a limit is approaching \( \infty \), be able to specify if it is approaching \( +\infty \) or \( -\infty \). In particular, if \( \lim_{x \to a} f(x) \to \frac{k}{0^+} \), be able to specify if the denominator is approaching 0 as a sequence of positive numbers \((0^+)\) or if the denominator is approaching 0 as a sequence of negative numbers \((0^-)\). You might need to conclude this algebraically or graphically. Then consider the sign of the numerator relative to the sign of the denominator to decide if the overall limit is approaching \( +\infty \) or \( -\infty \).

- Use the Squeeze Theorem to show that \( \lim_{x \to a} f(x) = C \).

- Use limits to find all horizontal asymptotes of a function.

- Find values of \( a \) and \( b \) that make a piecewise defined function continuous.

- Use the Intermediate Value Theorem to answer a question.

- State the limit definition of derivative.

- For a given function \( f(x) \) use the limit definition to find \( f'(x) \).

- Take derivatives using any combination of rules from the derivatives handout.
• Calculate a derivative from a table of values.

• Understand the graph of $f'(x)$ and how it relates to $f(x)$. Answer questions about $f(x)$ using $f'(x)$ or match graphs to one another.

• Use logarithmic differentation to take a derivative.

• Use Implicit Differentiation to take a derivative.

• Calculate slopes of tangent lines or write equations of tangents for a given x-value (x=a), at a given point (a,b), or at a described point such as the x-intercept or the y-intercept.

• Solve a differential equation similar to those shown in Lecture 8 and WS8.

• Use the equation $y = Ce^{kx}$ to answer a question.

• Use Newton’s Law of Cooling to answer a question.