Instructions. Exam 2 covers sections 3.9, 3.10, 4.1 - 4.5, 4.7 - 4.9 in the textbook. Any material covered in Lectures 10 - 16, HW 9 - 14, and Worksheet 10 - 17 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. You will need to create your own list when reviewing the lecture notes. A special emphasis should be given to “theorems with names”.

- Answer a related rates word problem in free response. No partial credit is given for work where the problem is begun by incorrectly setting up the equations. Please try the suggested problems from Section 3.9 posted on the class webpage for more practice.

- Answer an optimization word problem in free response. No partial credit is given for work where the problem is begun by incorrectly setting up the equations. Since optimization word problems ask you to find the absolute min or absolute max of a quantity, either bound your variable in a closed interval and use the table method to justify you have found an absolute min/max, or if working in an open interval explain why a single critical point that is a local min/max can be an absolute min/max. Please try the suggested problems from Section 4.7 posted on the class webpage for more practice.

- Given a graph of $f$, $f'$, or $f''$, sketch graphs of $f$, $f'$, or $f''$. This can involve sketching a graph of a derivative or an antiderivative.

- Given a drawing of or equations for $f$, $f'$, $f''$, be able to answer questions about the intervals of increase/decrease, critical points, intervals of concavity, inflection points, local maxes/mins for the function $f$, $f'$, or $f''$. If you are sketching numberlines for $f'$ and $f''$, be sure to consider the domain of your function as an appropriate “background” for the number line.

- Compute the absolute min/max of a function over a closed interval using the extreme value theorem and creating a table to check the heights of the critical points and the endpoints of the interval which lie inside the domain.

- Use linear approximation to estimate a function value. Conclude if your estimate is an overestimate or underestimate by being able to draw the tangent line on the graph of the function, or by considering the concavity of the function.
• Use differentials to estimate a change in a function value (i.e. “estimate the error in the output”).

• State precisely the Mean Value Theorem and use it in an application.

• State precisely Rolle’s Theorem and use it (along with the Intermediate Value Theorem) to show a given polynomial has exactly 1 root.

• Evaluate the limit of the given function by potentially using L’Hopitals Rule (or evaluate the limit by knowing not to use L’Hopitals rule). This may involve evaluating a limit which is initially trending toward an exponential indeterminant form.

• Compare two functions to decide which is growing faster as $x \to \infty$. This is an application of L’Hopitals Rule.

• Answer a question involving Newton’s Method.

• Compute a general antiderivative for a given function, or given a set of conditions compute a particular antiderivative.

• Solve a word problem using antiderivatives, possibly involving knowing that acceleration due to gravity is a constant. ($a(t) = -32 \text{ft/sec}^2$ or $a(t) = -9.8 \text{ft/sec}^2$.)