Objectives for Exam #4

To be well-prepared for Exam #4, you should

- be able to state and use the linear approximation formula and the linearization $L(x)$ of a function $f(x)$
- understand the graphical relationship between the linearization $L(x)$ and $f(x)$
- use linear approximation to estimate percentage errors
- know the definitions of critical points, inflection points and all forms of extreme values: absolute/local and maxima/minima
- know sufficient conditions that guarantee the existence of absolute extrema of a function (Theorem 3).
- find absolute extrema of functions
- be able to state the Mean Value Theorem and explain how it is used to link the derivative of a function with intervals on which the graph of the function is monotone increasing or monotone decreasing
- know the definitions of inflection points and concavity and how they are related to derivatives
- know all seven of the indeterminate forms for limits and be able to use L'Hôpital's Rule to evaluate such limits
- know the definition of $f(x) \ll g(x)$
- be able to sketch graphs of functions with enough detail to illustrate: intervals where the function is increasing, decreasing, concave up, concave down, critical points, local maxima, local minima, inflection points, vertical asymptotes and horizontal asymptotes
- be able to describe what a positive third derivative on an interval means in terms of the graph of that function
- be adept at translating an applied optimization problem from English, in paragraph form, into a mathematical statement of the form:

  Optimize: $f(x)$
  Subject To: constraints

- be able to solve applied optimization problems — including the details of how you know your answer is an absolute maximum or minimum.