Roughly speaking, the second exam will cover sections 2.3-2.8 and also 3.1 and 3.2. You need to know the following things.

1. Definitions. You need to know these so that you can accurately and precisely work with them.
   (a) the linearization of \( f(x) \) at \( x = a \)
   (b) local and global (i.e. absolute) maximum and minimum
   (c) critical number

2. Theorems/Facts. You need to know these so that you can apply them to help you solve problems. Unless the theorem has a name, you will not be asked to provide justification for its use. However, as is explained below, you will be expected to justify the use of any theorem with a name.
   (a) The rules for derivatives. In all of these, we assume \( c \) is constant and that \( f(x) \) and \( g(x) \) are differentiable.
      - \( \frac{d}{dx} c = 0 \)
      - \( \frac{d}{dx} cf(x) = c \frac{d}{dx} f(x) \)
      - \( \frac{d}{dx} x^n = nx^{n-1} \), for any real number \( n \)
      - \( \frac{d}{dx} [f(x) + g(x)] = \frac{d}{dx} f(x) + \frac{d}{dx} g(x) \)
      - Product Rule
      - Quotient Rule
      - Chain Rule
      - the derivatives of all 6 of the trig functions (yes! I expect you to know these!)
   (b) Extreme Value Theorem
   (c) Fermat’s Theorem
   (d) Rolle’s Theorem
   (e) Mean Value Theorem
   (f) If \( f'(x) = 0 \) for all \( x \) in the interval \((a,b)\), then \( f(x) \) is constant on \((a,b)\).
   (g) If \( f'(x) = g'(x) \) for all \( x \) in the interval \((a,b)\), then \( f - g \) is constant on \((a,b)\).

3. Computations. You need to be able to do the appropriate computations to solve problems involving these things.
   - differentiate functions
   - implicit differentiation
• find the tangent line to a curve at a given point
• solve related rates problems
• use the linearization of \( f \) to approximate the values of \( f \) near a given point
• use differentials to compute maximum errors
• compute critical numbers
• find the local and global extrema of a function on a closed interval (and over all of the real numbers)

4. Practice Problems. Here is a list of good practice problems. For the textbook problems, I suggest starting with the odd problems so that you can check your work, and doing the evens if you need more practice. You do not need to do all of these, just enough so that you know that you know what you’re doing.

• All problems from previous worksheets.
• All past homework problems.
• From the chapter 2 review:
  – Page 140 ~ Concept Check: #9-11
  – Page 140 ~ True-False Quiz: # 2-7
  – Pages 141-143 ~ Exercises: # 13-71 (not 65d), 72a, 73a, 74-82 - Note: I have not tested the numbers in these, try not to use your calculator, but you may need/want it on some of them.
• From the chapter 3 review:
  – Page 195 ~ Concept Check: # 1-4
  – Page 196 ~ True-False Quiz: # 1-4
  – Pages 141-142 ~ Exercises: # 1-4, 23-25