I. Derivative Rules
• There will be a page or so of derivatives on the exam. Know how to apply all the derivative rules. (WS 12 and 13)

II. Functions of One Variable
• Be able to find local optima, and to distinguish between local and global optima.
• Be able to find the global maximum and minimum of a function $y = f(x)$ on the interval from $x = a$ to $x = b$, using the fact that optima may only occur where $f(x)$ has a horizontal tangent line and at the endpoints of the interval.

  Step 1: Compute the derivative $f'(x)$.
  Step 2: Find all critical points (values of $x$ at which $f'(x) = 0$.)
  Step 3: Plug all the values of $x$ from Step 2 that are in the interval from $a$ to $b$ and the endpoints of the interval into the function $f(x)$.
  Step 4: Sketch a rough graph of $f(x)$ and pick off the global max and min.
• Understand the following application: Maximizing TR(q) starting with a demand curve. (WS 15)
• Understand how to use the Second Derivative Test. (WS 16)
  If $a$ is a critical point for $f(x)$ (that is, $f'(a) = 0$), and the second derivative is:
  - $f''(a) > 0$, then $f(x)$ has a local min at $x = a$.
  - $f''(a) < 0$, then $f(x)$ has a local max at $x = a$.
  - $f''(a) = 0$, then the test tells you nothing.

  IMPORTANT! For the Second Derivative Test to work, you must have $f'(a)$ = 0 to start with! For example, if $f''(a) > 0$ but $f'(a) \neq 0$, then the graph of $f(x)$ is concave up at $x = a$ but $f(x)$ does not have a local min there.

III. Functions of Two Variables
• Be able to compute overall, incremental, and instantaneous rates of change of a function of two variables. (WS 17)
• Be able to compute partial derivatives using all the derivative rules.
• Know how to find the candidates for maxima and minima in a function of two variables. (Take both partial derivatives, set them equal to 0, and solve the resulting system of equations.)
• Be able to set up and solve a linear programming problem. (WS 18)

  Step 1: Find the objective function.
  Step 2: Find the constraints.
  Step 3: Graph the feasible region and find its vertices.
  Step 4: Plug all vertices into the objective function. (The max and min of the objective function must occur at one of the vertices.)