MATH 112
REVIEW FOR EXAM II (WS 12 -18)

I. Derivative Rules

• There will be a page or so of derivatives on the exam. You should know how to apply all the derivative rules, alone or in combination. (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 either where f(x) has a horizontal tangent line, or 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 $x=a$ is a **critical point** for $f(x)$ (that is, $f'(a) = 0$), **and** if the **second derivative** at $x=a$ satisfies:

- $f''(a)$ *is positive*, then $f(x)$ has a local min at x = a.
- $f''(a)$ *is negative*, 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 apply, you must start with a critical point! For example, if $f''(a) > 0$ but $f'(a) \neq 0$, then the graph of f(x) is concave up at that point, but $f(x)$ does not have a local min there.

III. Functions of Two Variables

• Be able to recognize, compute, and use/interpret various overall, incremental, and instantaneous rates of change of a multi-variable function. (WS 17)

• Be able to compute partial derivatives (WS 17)

• 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.)