Econ 315: Second Midterm Exam **Study Guide**
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Student: How to prepare for this exam?

Professor Raut: All the basic concepts covered in the class (see powerpoint presentations) after the first midterm. Review them first and take the graded online quiz like an exam.

Student: Which concepts and graphs should I know especially?

Professor Raut: Please do the following.

Chapter 6: (download the new powerpoint slides, which has less material)

(1) Read Section 6.3 (short-run production: one variable input and one fixed input), table 6.1, figure 6.1 that are related to table6.1. Understand the concepts of marginal product of labor (MP_L), average product of labor (AP_L)
(2) Review isoquant, figure 6.2, figure 6.3. Understand the concept of MRTS, which is the slope of the isoquant at a given point on the isoquant. Use the definition of **MRTS = the slope of an isoquant (important: it is the slope which is a negative number for convex isoquant, not the absolute value of the slope).** R
(3) Returns to scale, technological change.

Chapter 7:

(1) Section 7.2 short-run costs, table 7.1, definitions and computations of marginal cost, average cost, average variable cost, fixed cost, average fixed cost, Figure 7.1
(2) Effect of specific tax on producers
(3) Long-run cost (section 7.3) iso-cost lines, isoquant, solving the cost minimization problem, i.e., figure 7.5 and figure 7.6. Table 7.4.

Here is a solved problem done in the class that you should fully understand to do similar problems.

If $C(q) = 125 - 2q + q2$.
Fixed cost = $F = 125$
Variable cost = $VC(q) = -2q + q2$
Average cost = $AC(q) = C(q)/\mathrm{q} = 125/q - 2 + q$
Average fixed cost = $AFC(q) = 125/q$
Average variable cost = $AVC(q) = -2 + q$
Marginal cost = $MC(q) = -2 + 2q$ (which is the same as $C'(q)$ or $\frac{dC(q)}{dq}$)

Review of calculus: Know how to take derivative of functions of one and two variables. Here are some for your review. Recall for a function of one variable $f(x)$, the derivative is denoted either as $f'(x)$ or $\frac{df(x)}{dx}$, both approximate $\frac{\Delta f}{\Delta x}$

(1) $f(x) = 3x^n \Rightarrow f'(x) = 3nx^{n-1}$

(2) $f(x) = 3x^{1/2} \Rightarrow f'(x) = \frac{3}{3}x^{-1/2}$

(3) $f(x) = 120 - 2x + 5x^2 + 2x^{1/3} \Rightarrow f'(x) = 0 - 2 + 10x + \frac{2}{3}x^{-2/3}$

(4) $f(x) = K - cx + yx^2 \Rightarrow f'(x) = 0 - c + 2yx$ (Here K, c and y are constants like numbers)

(5) $q(K) = 2K^{1/3} \Rightarrow q'(K) = \frac{2}{3}K^{-2/3}$ (the argument of a function could be any letter, e.g. K in this case and the name of the function could be anything here it is q(.)).

For functions of two variables f(x,y) there are two partial derivatives, one with respect to x and denoted as $\frac{\partial f(x,y)}{\partial x}$ which approximates $\frac{\Delta f}{\Delta x}$ when y is fixed. This derivative you calculate just like in the function of one variable by treating y as a cosnt, i.e., wherever you have y in the expression of the function, think of it as a constant and take the derivative with respect to x just like in the example (4) above. The partial derivative with respect to y is analogous. Here are some examples:

(1) $f(x,y) = 20 + 3x + 4xy^2 \Rightarrow \frac{\partial f(x,y)}{\partial x} = 0 + 3 + 4y^2$ and $\frac{\partial f(x,y)}{\partial y} = 0 + 0 + 8xy$

(2) $F(K,L) = 3K + 2L + L^{1/2} \Rightarrow \frac{\partial F(K,L)}{\partial K} = 3$ and $\frac{\partial F(K,L)}{\partial L} = 2 + \frac{1}{2}L^{-1/2}$