Introduction To Quantitative Economics: Problem Set 4

November 23, 2015

Question 1

Given a firms current level of capital and labour inputs, the marginal product of labour for its production process is equal to 3 units of output. If the marginal rate of technical substitution between K and L is 9, what is the marginal product of capital?

Question 2

Suppose that from the last seconds you devoted to answering Question 1 on your first test you earned 4 extra points, while from the last seconds devoted to Question 2 you earned 6 extra points. The total number of points you earned on these two questions were 20 and 12 respectively, and the total time that you spent on each was the same. The total number of points possible on each problem was 40. How - if at all - should you have reallocated your time between problems?

Question 3

Consider the production function **(i)** $f(x_1, x_2) = x_1^2 x_2^2$ and **(ii)** $f(x1, x2) = 4x_1^{1/2} x_2^{1/3}$. For each production function answer whether it exhibits constant, increasing or decreasing returns to scale?

Question 4

Suppose production processes A and B give rise to the following marginal and average total cost curves: $MC^A = 12Q^A$ and $ATC^A = 16/Q^A + 6Q^A$. In contrast, $MC^B = 4Q^B$ and $ATC^B = 240/Q^B + 2Q^B$ where the superscripts denote production processes A and B respectively. What is the least costly way to produce a total of 32 units of output?

Question 5

Suppose capital and labour are perfect complements in a one to one ratio. That is, suppose that $Q = min(L, K)$. Currently, the wage is $w = 5$ and the rental rate is $r = 10$. What is the minimum cost and method of producing $Q = 20$ units of output? Suppose the wage rises to $\hat{w} = 20$. If we keep total cost the same, what level of output can now be produced and what method of production (input mix) is used?