Assignment I

ECON 2020E Intermediate Microeconomics: Producers and Market Structures

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Notes. The first assignment is due at the beginning of the fifth class (6:05 pm on October 4, 2012); failing to hand in Assignment I on time will lead to a grade of FND (failure with no deferred Final examination allowed).

This assignment contains TEN questions. Please answer all the questions.

Question 1 (1 Mark)
Is the following statement true or false? Also provide detailed explanations to support your judgment.

One million automobiles have a defect that could cause the car to explode; however, only one of those cars will actually explode. Nobody knows which one car it is. When the car does explode, the victim's family will sue the automaker for $1 million and win. The defect costs $2 per car to repair. What does economics predict about the automaker's decision to repair the defect?

Question 2 (5 Marks)
Is the following statement true or false? Also provide detailed explanations to support your judgment.

Under most circumstances, the application of taxes on goods will only affect who gets the goods.

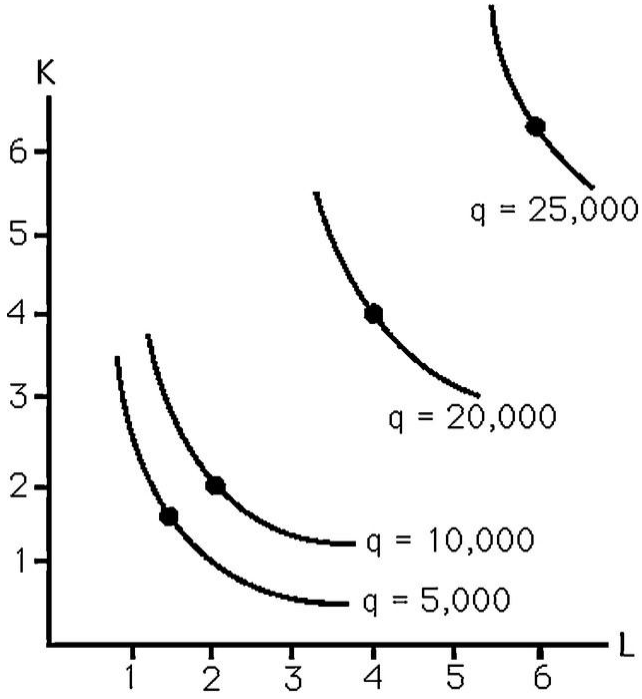
Question 3 (10 Marks)
Erica's cake shop has the production function $q = 14L + 24L^2 - 2L^3$.

a) Calculate the marginal product and average product of labor and explain their economic meanings in details.
b) Discuss how marginal product and average product will change as the labor increases.
c) Draw the marginal product and average product from part (a) on a graph and also highlight the important points you derived from part (b).

Question 4 (15 marks)
Suppose the production function for T-shirts can be represented as $q = K^{0.2}L^{0.8}$.

a) Is this production function a short-run or long-run production function? Why? Write down the corresponding short-run production function.
b) What is an isoquant? Draw the isoquant on a graph? (Approximate shape of the curve will be sufficient)
c) Calculate the slope of the isoquant.
d) Illustrate the economic meaning of the slope of the isoquant.
e) Calculate the elasticity of substitution for this production function and provide the economic meaning for the elasticity of substitution.

Question 5 (10 marks)



The above figure shows the isoquants for producing steel. Please identify the various returns to scale associated with different levels of isoquants (Increasing returns to scale, decreasing returns to scale, and constant returns to scale)

Question 6 (10 marks)
Provide a graph and an explanation to show that the production function $q = K^{0.5}L^{0.5}$ has diminishing marginal product of labor but has constant returns to scale.

Question 7 (14 marks)
Alison lives in a small town where she plans to hire workers to help her make candy. Her production function for candy is

$$q = 4LK^{0.5}.$$

She begins producing with K=4. The cost of capital is \$50/unit. The wage depends on the amount of workers she employs. Specifically, $w(L) = 10 + 2L$.

a. Does Alison's production function exhibit diminishing marginal return to labor? Explain.
b. Derive Alison's short-run cost function.
c. Draw the marginal cost on a graph.
d. Derive the relationship between MC and MP? Show this explicitly.

Question 8 (5 marks)
Illustrate what the isocost function and isocost line are. (Hint:use functions and graphs to finish your answer in detail, and also provide the economic meanings)

Question 9 (15 marks)

Suppose Ralph hires workers at his supermarket at a wage of $12/hour. Ralph currently has 10 check stands (i.e., capital) with a rental rate of $10/hour. Production of customers served (i.e., output) is determined by the hourly production function

$$f(L,K) = L^{0.75}K^{2}$$

For the questions that follow, the number of check stands is fixed. Show your work clearly.

a. If Ralph wants to serve 400 customers per hour, how many workers must he employ? How much will it cost to serve 400 customers per hour?

b. Derive Ralph's short-run cost function with the 10 check stands.

c. Derive the equations for the MC, AC, AVC, and AFC.

d. If the number of check stands is not fixed and Ralph wants to spend $44,000 on his supermarket to hire workers and rent check stands, calculate the maximized number of customers served per hour.

Question 10 (15 marks)

Consider a firm with the production function $f(L,K) = LK$. The wage rate and rental rate on capital are w and r, respectively.

a) Using the Lagrangian, derive the firm's minimized cost in order to produce Q level of output. (Hint: first find the input bundles that will minimize the cost, and then calculate the minimized cost)

b) Using the graph to find the minimized cost in part (a).