ECON 4010/6010–001

INTERMEDIATE MICROECONOMICS/MICROECONOMICS

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Problem Set 3

Instructions: This Problem Set covers topics from our *Production* lectures. Recall that there is no need to turn in this assignment.

Problem 1

For the standard Cobb-Douglas production function:

$$q = AK^a L^b$$

answer the following questions:

(a) Show that, if $a + b = 1$, a doubling of K and L will double q.

(b) Show that, if $a + b < 1$, a doubling of K and L will less than double q.

(c) Show that, if $a + b > 1$, a doubling of K and L will more than double q.

(d) Using the results from the previous parts, what do you conclude about the returns to scale exhibited by the Cobb-Douglas production function?

Problem 2

For the Cobb-Douglas production function from Problem 1, answer the following questions:

(a) Compute the marginal product of labor.

(b) Compute the marginal product of capital.

(c) Suppose constant returns to scale. Show that both maginal products are diminishing in inputs.

(d) Show that $RTS_{L,K} = aL/bK$.

Problem 3

Suppose candy bars (q) are produced according to the following production function:

$$q = 3K + L$$

(a) What technology describes this production function?

(b) What are the marginal products of capital and labor?

(c) If the firm employs 10 units of capital, how many hours of labor are necessary to produce 100 candy bar units?

(d) If the firm employs 30 units of capital, how many hours of labor are necessary to produce 100 candy bar units?

(e) Graph the $q = 100$ isoquant.

(f) Now suppose technical progress shifts the production function to

$$q = 5K + 2L$$

Answer parts (b)–(e) once again.

Problem 4

Suppose a restaurant produces artisan pizzas (q). Each baker (B) must have one box of ingredients (I) to prepare a pizza. A skilled baker can produce 10 pizzas per hour.

(a) What kind of technology describes this restaurant?

(b) Sketch the production function isoquants for this restaurant for $q = 100$, $q = 150$, and $q = 300$.

(c) Suppose one location has 50 boxes ready to go. How many bakers are required to fully utilize these boxes? Also inform how many pizzas can be produced.