

HOMEWORK 3

Intermediate Microeconomics EC 308-004
October 16, 2007

Name: _____

by writing my name i swear by the honor code

Read all of the following information before starting the Assignment:

- You are allowed to work together on the homework. However, when it comes time for you to write up the solutions, you are required to do this on your own.
- Show all work, clearly and in order, if you want to get full credit. I reserve the right to take off points if I cannot see how you arrived at your answer (even if your final answer is correct).
- Justify your answers algebraically whenever possible to ensure full credit. When you do use your calculator, sketch all relevant graphs and explain all relevant mathematics.
- Circle or otherwise indicate your final answers.
- Please keep your written answers brief; be clear and to the point. I will take points off for rambling and for incorrect or irrelevant statements.
- This assignment has 5 problems and is worth 100 points. It is your responsibility to make sure that you have all of the answers!
- This assignment is due next Thursday, October 25 in class.
- Good luck!

1. (20 points) PROBLEM 1: This question has 3 parts:

# of Workers	# of Chairs	Average Product (AP)	Marginal Product (MP)
1	10		
2	18		
3	24		
4	28		
5	30		
6	28		
7	25		

a. (10 pts) PART A: Calculate the marginal and average product of labor for this production function.

b. (5 pts) PART B: Does this production function exhibit diminishing returns to labor? Explain.

c. (5 pts) PART C: Explain intuitively what might cause the marginal product of labor to become negative.

2. (20 points) PROBLEM 2: Fill in the gaps in the table below.

Input Units	Total Output	Marginal Product (MP)	Average Product (AP)
0	0		
1	225		
2			300
3		300	
4	1140		
5		225	
6			225

3. (20 points) PROBLEM 3: Do the following functions exhibit increasing, constant, or decreasing returns to scale? What happens to the marginal product of each individual factor as that factor is increased and the other factor held constant? (Hint: For the second question take the first derivative of the MP with respect to that factor).

a. (5 pts) PART A: $q(K, L) = 3L + 2K$

b. (5 pts) PART B: $q(K, L) = (2L + 2K)^{1/2}$

c. (5 pts) PART C: $q(K, L) = 3LK^2$

d. (5 pts) PART D: $q(K, L) = L^{1/2}K^{1/2}$

4. (*20 points*) PROBLEM 4: The production function for a product is given by $q(K, L) = 100KL$. If the price of capital is \$120 per day and the price of labor \$30 per day, what is the minimum cost of producing 1000 units of output? (Hint: Set-up the Lagrangian to minimize $C = wL + rK$ subject to the constraint that $q(K, L) = 1000$ and solve for K and L in terms of C_0).

5. (20 points) PROBLEM 5: Suppose a production function is given by $F(K, L) = KL^2$; the price of capital is \$10 and the price of labor is \$15. What combination of labor and capital maximizes the output given a fixed cost of C_0 ? (Hint: Set-up the Lagrangian to maximize $q(K, L)$ subject to the constraint that $wL + rK = C_0$).

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