

Econ 301 Homework 4

due April 4, 2012

Provide complete work that leads to each answer. Do the problems in the order given.

Instructor: Ming Li

1. TRUE or FALSE (3 points each). All credits will be assigned to explanations.
 - a. If a good is a normal good for all consumers, the marginal revenue curve always lies below the demand curve. (Hint: use what we learned in Chapters 8 and 15.)
 - b. In a two-good model, if one good is an inferior good, then the other good must be a luxury good.
 - c. Montreal has had a very mild winter and suppose supply of down coats has not changed, then in the market equilibrium, the quantity of down coats will go down because demand decreases.
 - d. Two firms employ the same factors of production to produce the same product. We also know that both their technologies exhibit constant returns to scale. Then, if the factors firm 1 uses are exactly twice the amount of those firm 2 uses, firm 1 must produce twice the output that firm 2 produces.

2. (8 points) Suppose the market demand for a good consists of two consumers, 1 and 2, where their respective individual demands are: $D_1(p) = 200 - 4p$ and $D_2(p) = 100 - p$. Note that demand cannot be negative, so what we really mean is $D_1(p) = \max\{200 - 4p, 0\}$ and $D_2(p) = \max\{100 - p, 0\}$.
 - a. (3 points) On one diagram graph the individual demand curves as well as the resulting market demand curve. Mark the intercepts correctly.
 - b. (2 points) Suppose supply is given by $p = 40$, that is, the supply is perfectly elastic. Find the amount purchased by each consumer. Illustrate your answer with a graph.
 - c. (3 points) Now, suppose instead the supply is given by $q = 20$. Find the equilibrium market price. (Be very careful here.) Illustrate your answer with a graph.

3. (6 points) Calculate the *income* elasticities for the following demand functions.
- (3 points) $x(p, m) = \frac{m}{2p}$.
 - (3 points) $x(p, m) = \frac{10}{p}$.
4. (12 points) Suppose the market demand function is given by $D(P_D) = 60 - P_D$ and $S(P_S) = 2P_S$.
- (2 points) Find the market equilibrium without taxes (that is, when $P_D = P_S$).
 - (3 points) Suppose now the supplier is required to play a per unit tax of $t = 3$. Draw a graph to show the change in the supply curve. Find the equilibrium quantity and prices, q^* , P_S^* , and P_D^* . How much of the per unit tax is passed on to the consumer? (Hint: in this case, the vertical axis is the demand price.)
 - (2 points) Suppose now the *demand*er is required to play a per unit tax of $t = 3$. Draw a graph to show the change in the demand curve. Find the equilibrium quantity and prices, q^* , P_S^* , and P_D^* . (Hint: in this case, the vertical axis is the supply price.) Compare your answers in parts b and c.
 - (5 points) Calculate the change in consumer's surplus, change in producer's surplus, tax revenue, and deadweight loss as a result of the policy change. Illustrate them on a graph.
5. (10 points) Calculate the marginal products and technical rates of substitution for each of the following technologies. Determine also whether they exhibit increasing, constant, or decreasing returns to scale.
- $f(x_1, x_2) = x_1 + 2x_2 + 1$.
 - $f(x_1, x_2) = Ax_1^{1/2}x_2^{1/3}$.

6. (12 points) Consider a firm that employs capital k and labor l in production. Its production function is $f(k, l) = 2k^{1/3}l^{1/2}$. The price of output is $p = 1$.
- (3 points) Does the technology exhibit constant, decreasing, or increasing returns to scale?
 - (4 points) Find the marginal product of each factor and the technical rate of substitution. Determine if the technology has diminishing marginal product in either factor.
 - (5 points) Suppose in the short run, capital is fixed at $\bar{k} = 27$. What extra information do you need to determine the exact amount of labor to be employed in order to maximize short-run profits? Provide a suitable number yourself, and find how much labor is employed. Illustrate your answer with a graph.