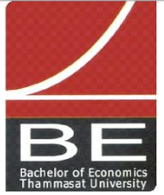




B.E. International Program

Faculty of Economics, Thammasat University



EE 320 Introductory Mathematical Economics

Semester 2/2015

Homework 1

Due 11th February 2016 (during the lecture / before 11:15 am)

There are six questions in total. Each of them is worth equally.

1. Mr. Push produces shoes for sale, and his total cost function is given by $C(Q) = 105 + 23Q$, where Q is the output level.

- (4 points) Suppose that Mr. Push sells his shoes in a perfectly competitive shoe market at the price \$30 per pair. How many pairs of shoes should Mr. Push sell in order to break-even?
- (6 points) Suppose now that Mr. Push is the only producer in this market (because his shoes have special designs), and the demand function he faces is $Q_d = 153 - P$. If he is still able to sell his shoes at the break-even amount in the competitive market (i.e. the quantity found in part a.), What is his new profit?

2. Consider the following system of equations:

$$Q_{d1} = 33 - 4P_1 - 4P_2 + P_3 \quad Q_{s1} = 2 + P_1$$

$$Q_{d2} = 18 - 2P_1 - 3P_2 + 4P_3 \quad Q_{s2} = 3 + 2P_2$$

$$Q_{d3} = 15 + P_1 + 5P_2 - 4P_3 \quad Q_{s3} = 7 + 5P_3$$

- (2 points) What are the relationships among the three goods?
- (8 points) Find the equilibrium price and quantity for the three goods.

3. Consider the following IS-LM model:

Commodity market:

$$Y = C + I + G_0$$

$$C = C_0 + bY, \quad (C_0 > 0, 0 < b < 1)$$

$$I = I_0 - ar, \quad (I_0 > 0, a > 0)$$

Money market:

$$M_S = M_0$$

$$M_D = mY - hr, \quad (m > 0, h > 0)$$

- a. (2 points) Write out the explicit IS-LM system of equations,
- b. (2 points) Determine the equilibrium national income and equilibrium interest rate.
- c. (2 points) Find the impact of an exogenous increase in money supply (M_0) on the equilibrium interest rate found in part (a). Assume everything else remains constant.
- d. (2 points) Suppose that $C_0 = 250$, $I_0 = 150$, $G_0 = 50$, $b = 0.8$, $a = 1000$, $h = 1500$, $M_0 = 200$, and $m = 0.4$. Find the equilibrium national income and interest rate.
- e. (2 points) Based on the information in part (c), if the government expenditure (G_0) increases to 120, all else constant, what is the *change* in the equilibrium national income?

4. Consider a café that serves both pizza and cookies. Suppose the demand curve and supply curve for pizza in a café are given by

$$\text{Demand: } Q = 300 - 20P - 20P_c$$

$$\text{Supply: } Q = 10P - 10$$

where P is the price of a pizza, and P_c is price of a cookie.

Answer the following questions:

- a. (3 points) Suppose the price of a cookie is $P^c = 5$. Find the equilibrium price and quantity of pizza.
- b. (4 points) Due to a change in the price of cookies, the new equilibrium price of pizza changes to $P^{*'} = 5$. What must be the price of a cookie now?
- c. (3 points) Are pizza and cookies substitutes or complements in this example? Use your economic intuition to justify your answer.

5. AT&T, T-mobile and Verizon all want to purchase some iPhone6 phones from Apple and hold these phones in stock so that they can promote their new contract with the iPhone6 incorporated as an important element. Their respective demand curves for iPhone6 phones are as follows where Q_a is the quantity of iPhone6 phones demanded by AT & T, Q_t is the quantity of iPhone6 phones demanded by T-mobile, Q_v is the quantity of iPhone6 phones demanded by Verizon, and P is the price per iPhone6 phone:

$$\text{AT\&T:} \quad Q_a = 30 - P$$

$$\text{T-mobile:} \quad Q_t = 20 - 0.5P$$

$$\text{Verizon:} \quad Q_v = 40 - 2P$$

5.1) Justify the domain set of prices that allow all the three providers staying active in the market.

5.2) Derive the equation for market demand

Now continue with a new piece of information given. On the supply side in this market suppose Apple, the manufacturer or provider of these phones, outsources their production of the iPhone6 phones to two firms, Firm A and Firm B. These firms' supply curves are given below where Q_a is the quantity of iPhone6 phones supplied by Firm A, Q_b is the quantity of iPhone6 phones supplied by Firm B, and P is the price per iPhone6 phone:

$$\text{Firm A: } P = 15 + Q_a$$

$$\text{Firm B: } \cancel{P = 10 - 2Q_b} \quad P = 10 + 2Q_b$$

5.3) Derive the market supply equation.

5.4) (Hard) Based on the market demand curve in question (5.1), what is equilibrium price and quantity in this market? Explain how you found your answer and how you decided which segments of the demand curve and the supply curve were the relevant segments to consider.

6. The demand and supply curves in the market for whiskey are given by the following equations:

$$\text{Demand:} \quad Q_d = 120 - 3P$$

$$\text{Supply:} \quad P = 0.5Q_s$$

where Q is the quantity of whiskey in bottles and P is the price per bottle of whiskey.

Answer the following questions:

- a. (1 point) Find the pre-tax equilibrium price and quantity, i.e. (P^*, Q^*) .

- b. (1 point) Calculate the price elasticities of demand and supply at the equilibrium.
- c. (1 point) Based on the values of calculated elasticities, can you tell us anything about the change in the total revenue if the market price can be increased by 1%?

Now suppose that the government in this economy has levied an excise tax of \$5 on the *suppliers* of whiskey.

- d. (2 points) Find the post-tax equilibrium price and quantity.
- e. (2 point) How much total revenue can government collect?
- f. (3 point) In terms of economic incidence, what percentage of the tax is actually borne by suppliers?