Econ 001: Midterm 2
Answer Key
Nov 15, 2006

Instructions:

- **This is a 60-minute examination.**
- **Write all answers in the blue books provided. Show all work. Use diagrams where appropriate and label all diagrams carefully.**
- **Write your name and your Recitation Instructor's name in every blue book that you use.**
- **This exam is given under the rules of Penn's Honor system.**
- **All blue books, blank or filled, must be handed in at the end of this exam. No blue books may be taken from the room.**
- The use of Programmable Calculators is in violation of Departmental rule. It is strictly forbidden!

The Midterm has 2 parts.
Part 1 consists of 9 multiple-choice questions. Please write you answers in blue book 1.
Part 2 consists of 2 short answer questions. Please use a separate blue book for each answer.

Part I: Multiple Choice Questions (4 points each/32 points total):

1. Greg spends all of his income on apples and bananas and is originally consuming positive quantities of both goods. Suppose the price of bananas increases and bananas are an inferior good. Then, at the new equilibrium:

   a. The MRS of apples to bananas decreases
   b. The MRS of apples to bananas increases
   c. The MRS of apples to bananas is constant
   d. Cannot determine because bananas are an inferior good

2. Assume that Spam (canned meat) is an inferior good. If the price of Spam falls, then the substitution effect results in the person buying _____ of the good and the
   income effect results in the person buying _____ of the good.

   a. more, more
   b. more, less
   c. less, more
   d. less, less

3. Consider the following statements when answering this question:

I. A firm's marginal cost curve does not depend on the level of fixed costs.
II. As output increases the difference between a firm's average total cost and average variable cost curve cannot rise.

a. I is true, and II is false.
b. I is false, and II is true.
c I and II are both true.
d. I and II are both false.

4. Based on the information below, what are the Total Fixed Costs?

Quantity	ATC	AVC	MC
1	10		
2		4	2

a. 2
b. 4
c. 6
d. 8

5. Which of the following statements is true?

I.   If, at a given quantity, the total revenue of a price-taker is larger than the total variable cost, the firm should increase production.
II.   If, at a given quantity, the marginal revenue of a price-taker is larger than the marginal cost, the firm should increase production.

a. Only I
b. Only II
c. I and II
d. Neither.

6. Suppose the monopolist faces the demand P=100-3Q, which means MR(Q)=100-6Q, and marginal cost is given by MC(Q)=4Q. What price will the monopolist charge the consumers in equilibrium?

a. $10
b. $20
c. $30
d. $70

7. Using the information from the previous question. If the monopolist could perfectly price discriminate, the lowest price he would charge for the last unit sold, would be _____ than that found above and consumer surplus would be _____ than before.

a. Lower, smaller
b. Lower, larger
c. Higher, smaller
d. Higher, larger

8. In a monopolistically competitive industry profits in the long run must be zero as a consequence of:

a. Demand being downward sloping.
b. There being free entry and exit.
c. There being excess capacity.
d. All the above are correct.

9. There are two firms, A and B, in the market for sneakers. Each firm must decide whether or not to invest in the development of a new product. The profit matrix of firms' decisions is:

(In terms of $millions)		Firm B	
		Invest	Don't Invest
Firm A	Invest	Firm A: 20 Firm B: 20	Firm A: 40 Firm B: -3
	Don't invest	Firm A: -3 Firm B: 4	Firm A: 5 Firm B: 50

What will be the Nash Equilibrium of the investment game?

a) Both firms choose Invest.
b) Both firms choose Don't Invest.
c) Firm A chooses Invest & firm B Don't Invest.
d) Firm A chooses Don't Invest & firm B Invest.
e) There is no Nash Equilibrium to this game.

.

Answer Key
1. a
2. b
3. c
4. b
5. b
6. d
7. a
8. b
9. a

Part II: Short Answer Questions:

Please use a separate Blue Book to answer each of the 2 questions.

Q1. (**32 points**)

In the question below, parts a through c should be solved numerically.

In the toothbrush industry aggregate demand is given by:

$Q = 8000 - 14P$

There is a number of identical, perfectly competitive firms active in the industry, with the following costs of production:

$FC = 36$

$MC = 4 + 2q$

$AVC = 4 + q$

a. Suppose each firm is able to sell as many toothbrushes as it wants at the price of 20. How many toothbrushes will each firm produce?

Answer: Each firm sets $MC = MR \Leftrightarrow 4 + 2q = 20 \Leftrightarrow q = 8$.

Points: 6
3 for MC=P/explanation
3 for Q=8

b. How many firms are currently active in the industry? What is the short run industry supply curve?

Answer: At $p = 20$ aggregate demand for toothbrushes is $Q = 8000 - 14*20 = 7720$. The number of active firms is then: $N = Q/q = 7720/8 = 965$.
We get the individual firm's supply from $MC = P \Leftrightarrow q = P/2 - 2$.
The industry supply is then: $Q = 965q = 965*(P/2 - 2) = 482.5P - 1930$.

Points: 6
2 for Q (1 for method)
2 for N=Q/q (give 1 point for method)
2 for industry supply.

c. What is the typical firm's economic profit/loss? What do you think will happen to the number of firms in this industry in the long run?

Answer:
Profit=Rev-Cost=Rev-(FC+VC)
Revenue=P*q=20*8=160
FC=36 (given)
VC=AVC*q=(4+q)*q=(4+8)*8=96
So Profit=160-36-96 = 28.
In the long run we expect the number of firms in this industry to increase because firms are currently making a positive economic profit.

Points: 6
3 for profit (2 for method)
3 for entry

d. What is the long run equilibrium price, P, and quantities q, Q. How many active firms, N, will there be in the long run?

Answer: $\text{ATC} = \text{TC}/q = (q^2 + 4q + 36)/q = q + 4 + 36/q$.
In the long run, the firms will produce where $\text{ATC} = \text{MC} \Leftrightarrow q + 4 + 36/q = 4 + 2q \Leftrightarrow q^2 = 36 \Leftrightarrow q = 6$ (since we are obviously interested in the positive solution).
Now $P = \text{MC} \Leftrightarrow P = 4 + 2*6 = 16$.
Aggregate demand is $Q = 8000 – 14*16 = 7776$.
The number of firms is: $N = Q/q = 7776/6 = 1296$.

Points: 8
2 for setting MC=ATC
1 for q
1 for p
2 for Q (1 method)
2 for N (1 method)

e. Suppose the government decides to give everyone who wants to start toothbrush production a one-time lump sum subsidy of X dollars to cover some of the start up costs. In words or graphically explain what will happen to the long run equilibrium P, q, Q, and N (no calculations necessary. State and explain whether each will increase, decrease or not change).

Answer: Given that the fixed costs are now lower each firm will be making profits in the short run and we should expect entry, so N1>N0.
The new profit=zero point will be at a smaller quantity (q1<q0) and a respective lower price (P1<P0). Lower price means that aggregate demand and hence aggregate supply (in equilibrium) will be larger (Q1>Q0).

Points: 3
3 for understanding that we have entry. N & Q both increase.
3 for understanding that ATC shifts down so q & p both decrease.

Q2. (32 points)

Comment: If you answered the question assuming that market demand is downward sloping but the demand facing the firm is not (i.e., perfect competition), explained part a in this way, continued the question with the assumption and did so clearly, you will get almost full credit.

Suppose you are a producer of T shirts facing a <u>linear</u> demand curve. You know that when the price per shirt is $10 the quantity demanded by the market is 80 shirts. If the price is reduced to $8 per shirt, the quantity demanded increases to 90.

    a.   What is the structure (or type) of industry you are in?

Answer: We see that quantity demanded is dependent on the price so this is clearly not perfect competition. In the case of T-shirts we probably have many firms with differentiated products and free entry, or monopolistic competition.

I am looking for two key points here:
1. understanding that demand facing the firm is downward sloping
2. reference to other criteria (e.g. free entry).

Points: 5
4 for understanding that downward sloping demand is not perfectly competitive.
1 for discussion of other criteria consistently with answer.

Because the production cost is only $5 per additional T shirt, a consultant suggests you produce 90 units, or even more, until the price reaches the level of $5 per unit. This he claims will maximize profits.

    b.   Discuss the consultant's suggestion.

    Answer: The consultant suggests that the firm produce where P=MC, but as demand is downward sloping this would imply that MR<P=MC or MR<MC which of course is not profit maximizing.

I am looking for an understanding that P=MC does not make sense in this case.

Points: 4

    c.   Graph the demand curve and the Marginal Revenue curve.

    Answer: A typical downward sloping Demand & MR.
Points: 4,
2 each. Basic graph is all I am looking for.

+2 bonus points for correct numeric answer.

d. Show (graphically) the optimal production of T shirts, the price, revenue & producer surplus.

Answer: Add a constant MC at $5. Show output where MR=MC and comparable price.
Revenue should be market as a rectangle of P*Q.
Producer Surplus is the area above the MC line and below price (a rectangle).

Points: 9
Constant MC: 1 point
Q*: 2 points
P*: 2 point
Rev: 2 points
Producer surplus: 2 points

You find that the economic profits at the output you found in part d are zero.

e. Explain what the fixed cost must be.
Answer: Profit=Rev-Cost=Rev-(FC+VC).
Profit=zero➔Rev=Cost➔Rev=FC+VC➔Rev-VC=FC
The area under MC curve equals VC.
And so we get producer surplus= Rev-VC=FC

Points: 5
3 for FC=producer surplus
2 for explanation

f. Is it worth producing T shirts? Explain.
Answer: Yes. The producer is getting a normal return on her investment. This normal return (or normal profit) is included in the calculation of costs.

Points: 5
2 yes
3 for explanation