ENG110 ***First Midterm Exam-SOLUTIONS***
Winter 2018
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Numeric Problems:

1. (24 points) In a perfectly competitive industry, there are 120,000 firms, each with an identical total cost, TC(Q) = $468.63+3Q^2$ with an industry demand of P = - 4Q + 300.

One of these firms, Edreams, found a way to develop technology that reduces costs. According to this, if Edreams spends $x, its total cost will be TC(Q) = $70+2Q^2$. (Since Edreams is one of 120,000 firms, the effect on the market price will be negligible.)

Alternatively, Edreams can spend $x on differentiating its product (that is, no longer producing a homogenous product as the rest of the industry) which will keep its TC as before but provide a demand line of P=-2Q+110 for Edreams' own differentiated product.

Explanation: This problem is designed to address the historic trend of concentration in markets. We observe less and less perfect competition and more and more monopolistic competition and even more Oligopolistic markets. We talked about race to the bottom in lectures. That is, competing only in cost drives the price down to zero and leaves the firms with no viable profit. Then, companies turn to strategies such as purchasing other companies and increasing market share to have control over the price, differentiating their products for customer loyalty.

Solution:

a) (14 points) Should Edreams invest on cost reduction or product differentiation?

MC = 6Q

Industry supply is 120,000(P/6) = Q, P = Q/20,000

Market quantity is Q/20,000 = -4Q+300, Q = 74.99

Market price is very low, P=0.00375

Each firm will produce, 0.00375=6Q, Q = 0.000625*

Edreams Profit: $0.00375*0.000625-468.63-3*0.000675^2 = -468.$

Since the market raced to the bottom, cost reduction will not help the company.

If invested on cost reducing tech:

0.00375 = 4Q

Optimal Q will still be close to zero and no positive economic profit will be earned.*

Instead, if investing on product differentiation:

MC=MR

$6Q = 110-4Q$, Q = 11, P=88, Profit = $88*11-468.625-3*11^2 =136.375$*

b) (6 points) Given the choice in part (a), what is the maximum $x?

Cost reducing tech increases profit from -$468 to roughly $136. Then the difference is the maximum that can be invested on ~~this technology~~ product differentiation.

c) (4 points) Given the choice in (a), what would be the long run concerns Edreams has to be aware of?

Product differentiation will eat up revenue via advertisement and marketing….hence, why companies spend so much money on ads.

2. (16 points) Total Cost (TC) of a monopolistically competitive firm is given by:

TC = 30,000 + 50Q - $Q^2/100$ which implies an unusual marginal cost.

Firm faces a demand given by P = 160-4Q.

a) (12 points) What is the optimum quantity and price?

*MC = 50-Q/50 MR = 160-8Q, Q = 13.78, P = 160 – 4*13.78 = 104.88*

b) (4 points) If this firm were to be operating in a perfectly competitive market rather than a monopolistically competitive market, what would be the optimum Q? *Infinity.*

3. (20 points) Suppose that there are two firms, A and B, each introducing a new product to the market by choosing their spending level(cost). They will simultaneously decide on whether to choose a high(H) cost of $14million, medium(M) cost of $12million, or low(L) cost of $10 million, without knowing what the other will spend. The following table is common knowledge and summarizes the revenue that each firm will get under each case (in million $):

		Firm B		
		L	M	H
Firm A	L	16, 29	37, 32	36,20
	M	17, 10	40, 50	20,20
	H	10,10	10,30	38,60

a) (10 points) What is the most expected outcome given that companies have enough funds of their own to invest?

		Firm B		
		L	*M*	*H*
Firm A	*L*	*6, 19*	*27, 20*	*26,6*
	M	*5, 0*	*28, 38*	*8,6*
	H	*-4,0*	*-4,18*	*24,46*

BOTH COMPANIES WILL CHOOSE M.

b) (10 points) Now, assume, neither A, nor B has any funds. They will have to borrow the required cost from a financial institution which promises a bigger investment subsequently to that company that achieves the **highest return per dollar invested (**i.e, If I invest $1 and get $1.5 revenue, my return is 50%**)** . Which level of investment will be picked by each company?

		Firm B		
		L	*M*	*H*
Firm A	*L*	*16/10, 29/10*	*37/10, 32/12*	*36/10,20/14*
	M	*17/12, 10/10*	*40/12, 50/12*	*20/12,20/14*
	H	*10/14,10/10*	*10/14,30/12*	*38/14,60/14*

	Firm B

		L	*M*	*H*
Firm A	*L*	*1.6, 2.9*	*3.7, 2.67*	*3.6,1.43*
	M	*1.42, 1*	*3.33, 4.17*	*1.67,1.43*
	H	*0.71,1*	*0.71,2.5*	*2.71,4.29*

BOTH COMPANIES WILL CHOOSE L this time.

4. (20 points) Provon is a monopolistically competitive firm. Currently, Provon charges $20 per unit and is able to sell 2400 units at this price. Provon knows that for every dollar increase in price, 320 less units are sold.

Provan's per unit variable cost is 0 if Q=0 and increasing by $5, each time production increases by 1 unit.

a) (16 points) Is Provon operating at the profit maximizing level in terms of price it charges and quantity it produces?

Demand: P= -Q/320 + 27.5

MR = -Q/160 + 27.5

AVC = 5Q

TVC = $5Q^2$

MC = 10Q

MR = MC, 10Q=-Q/160+27.5, Q = 2.75, P* = 27.49*

Provan is not producing at the optimum.

b) (4 points) Provon knows that in the long run, entry will drive down its market share and its demand will be more price sensitive. In order to prevent that what can Provon do? (Verbal answer is enough to get full points)

Provan is already at a very tight spot. Therefore, an investment on making the demand line shift to the right and also make it steeper would be advisable. This usually happens with an effective ad campaign.

Multiple Choice Questions (4 points each):

1. For a monopolistically competitive firm:

   A. Economic Profit will be zero in the long run
   B. Product is differentiated
   C. Demand is price sensitive compared to the demand of a monopolist
   D. A and B
   E. A,B, and C

2. Being a Monopoly:

   A. requires a patent
   B. is illegal if market share is above 90%
   C. is "natural" if market demand is too big compared to fixed costs
   D. allows the firm to choose any price and any quantity at the same time
   E. none of the above

3. Which of the following is NOT correct?

   A. AVC is U-shaped only for total variable cost increasing at an increasing rate at all Q.

B. MC has to increase when MC is below AVC.
C. ATC will eventually increase if TVC is linear, increasing, and goes through the origin
D. Only A and B are NOT correct.
E. A, B, and C are all NOT correct.

4. Price Discrimination:

A. makes the demand less price sensitive
B. is a way of decreasing the fixed cost
C. is a way of increasing the consumer's willingness to pay
D. is the difference between consumer's willingness to pay and the average total cost
E. none of the above

5. Which of the following is NOT correct concerning short run/long run?

A. A perfectly competitive firm earns zero economic profit in the long run.
B. A monopolistically competitive firm may earn positive economic profit in the short run.
C. A firm can change its scale in the long run.
D. The duration of short run does not change from business to business.
E. The portion of the total cost that does not depend on quantity cannot be changed in the short run.