390 = Q1

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UCLA - ENG 110 Midterm

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1. (25 points) A company producing in a perfectly competitive industry has the following cost structure:

TFC = 20
TVC(Q) = 50 Q^2

$TC = 50Q^2 + 20$ $MC = 100Q$

Assume that there are 100 identical companies operating in this industry.

a) **(10 points)** What is the market price if the industry demand is given by P = 2480 - 30Q? (demand of industry)

$MC = 100Q^F = P \rightarrow Q^F = \frac{P}{100}$ $Q^I = \frac{100(P)}{100}$

$Q^I = P = 80$

$2480 - 30Q^I = Q^I$

$2480 = Q^I(31)$

$Q^I = 80$

b) **(5 points)** What is the profit obtained by each firm?

$80 = 100Q \rightarrow Q = 0.8$ $\pi = 64 - [50(0.8)^2 + 20]$

$80(0.8) = 64$ $\pi = 64 - 52$

$\pi = 12$

c) **(10 points)** How will this industry change in the long run? Will there be any entry? If so, let the total number of firms after the entry be x. Write the equation that will solve for x. DO NOT solve the equation as it involves higher order polynomials.

(For ease of calculation assume that any company that enters this industry will have the exact same scale and cost structure as others.)

Perfect Comp. easy entry. But no one is making economical profit, so it's not attractive to join

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~~15~~

2. (25 points) There are two firms, A and B, producing a homogenous product, X.
Total quantity demanded (by the entire market) at each price is given in the following table for product X. Ignoring the production costs, and assuming that each firm simultaneously decides how many units to produce, what will be the price in equilibrium?

(Assume that each firm prefers to produce less when the revenue obtained is the same at different quantities.)

Price	Total Quantity Demanded	$I = PQ$
1	132	132
2	120	240
3	108	324
4	96	384
5	84	420
6	72	432
5 ~~7~~	60	420
4 ~~8~~	48	384
3 9	36	324
2 ~~10~~	24	240
1 ~~11~~	12	132
12	0	0

totals not individual revenue

B

A \ B	1	2	3	4	5	6
1	(132, 132)	(132, 240)	(132, 324)	(132,	(132,	(132, 432)
2	(240, 132)	(240, 240)	240, 324			240, 432
3	(324, 132)	(324 240)	324, 324			324, 432
4	(384, 132)	(384 240)	384, 324			384, 432
5	(420, 132)	(420 240)	420, 324			(420, 432)
6	(432, 132)	(432 240)	(432, 324)	(132, 384)	(132, 420)	(432, 432)

price equilibrium is 6 ~~X~~

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3. (10 points) A monopolist that produces a non-perishable product has the following cost structure per year where all costs are due at the time of the production.

TFC = 400
TVC(Q) = 8 Q^2 + 12Q

The market demand is currently P = 300-30Q per year.

The demand will change every year so as to have 10% higher price at each quantity.

That is, if today (beginning of year 1) monopolist sells 2 units, it will be able to charge 300-30*2 = $240 per unit. Price will be $240*1.1 = 264 at the end of this year (same as beginning of next year), and, at the end of next year (same as beginning of the following year), it will be 240*1.1*1.1 = $290.4 etc.

Just like the price, the costs are increasing at 10% per year as well.

Assume that the production and sales can take place only at the beginning or end of any given year, not necessarily at the same time. Each year's production has to be sold by the end of that year. That is, year 1's production cannot be sold in year 2 or 3.

a) If the monopolist can borrow and lend at 10% per year, when should the production and sale take place in each of the coming **three** years? (Numerical answer required)

TFC = 400 + $8Q^2$ + 12Q; MR = MC; PQ = $300Q - 30Q^2$ = 300 - 60Q = MR

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b) If the monopolist can borrow and lend at 12% per year, when should production and sale take place in the coming **three** years? (can be verbally answered, no numerical answer is required)

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c) If the monopolist can borrow and lend at 8% per year, when should production and sales take place in the coming **three** years? (can be verbally answered, no numerical answer is required)

-2

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-6

4. (20 points) LATAE Inc. operating in a monopolistically competitive market has a demand for its product given by P = 84-2Q per year. The short run is one year and the corresponding total cost is given by 200 + 5 Q^2. All costs are due at the beginning of the year and the price is charged upfront, that is, obtained at the beginning of the year as well. LATAE's best alternative opportunity provides 10% per year in the market.

An international corporation approaches LATAE, today, to purchase the company at a price of 1,000.

IF I sell I can invest 1000 at 10%

Should LATAE sell the company today?

What would be your answer if LATAE's best investment opportunity were to be 4% per year?

$TC = 200 + 5Q^2$

$MC = 10Q$

$(84-2Q)Q = P \cdot Q$

$84 - 4Q = MR$

$MR = MC$

$84 - 4Q = 10Q$

$84 = 14Q$

$Q = \frac{84}{14} = 6$ ✓

$P = 84 - 2(6)$

$= 72$

$\pi = PQ - TC$

$\pi = (72)(6) - (200 + 5(6)^2)$

$432 - 380$

$= 124$ ← future ✗

$\frac{124}{(1+i)} = 112$ he should sell and invest

if he sold 1000 today → 1000 → PV

he should still sell even if the rate is 4% ✗

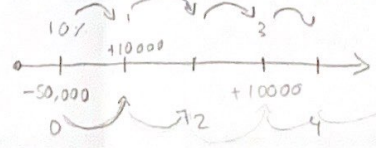
5. (20 points) You have two investment opportunities:

I: Invest 10% in the market per year

II: Invest $50,000 today to get 10,000 every two years beginning a year from today, forever.

X = investment

a) Which opportunity would you choose?



for every 2 years

effective rate?

$\frac{X}{(1+0.1)^n} \rightarrow Xe^{-1.1}$

$\frac{10,000}{(1+0.1)^{2n+1}} - 50000 = ? > 10000e^{-0.2} < 50000$

0.2

I would invest in the market at 10%.

10000 every 2 years has a value that is less than the 50000 I would have to pay

b) How much extra would you be willing to invest today in order to get paid $10,000 per year beginning a year from today, every year?

invest today $= \sum_{n=1}^{\infty} \frac{10000}{(1+i)^n} = 10000e^{-1.1} = 3328.71$

I would still do worse, so I would not be worth

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