ENG 110
Fall 2018
Midterm
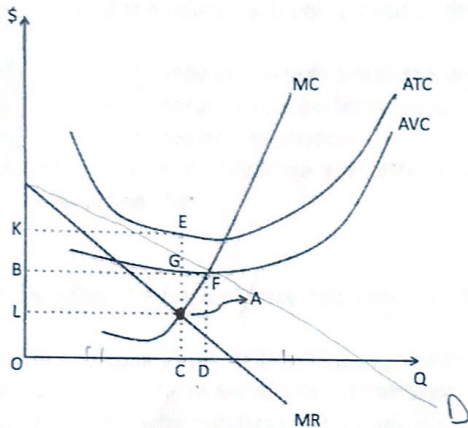Mel Bulu Taciroglu

NAME: ID#:

Multiple Choice Questions (4 points each):

Use the following graph to answer questions 1 through 4.

K	50
B	40
L	30
C	8
D	10

1, What is the total fixed cost?

a) 320
b) 240
c) 400
d) 80
e) Cannot be determined with the given information

$$K*C - B*C$$
$$TC - TVC = TFC$$
$$400 - 320 = 80$$

2. The firm (whose cost structure is given above) is indifferent between producing and not producing in the short run. The DEMAND line passes through:

a) E
b) G
c) F
d) A
e) Cannot be determined with the given information

3. If firm chooses to produce, what is the per unit fixed cost (AFC)?

a) between 40 and 50
b) exactly 12
c) exactly 10
d) exactly 30
e) Cannot be determined with the given information

4. Which of the following is correct about this firm?

a) This firm will stay in this industry in the long run
b) This firm is operating in a perfectly competitive industry
c) This firm cannot be a monopoly
d) If firm chooses to advertise in an effective way, its demand line will become flatter
e) none of the above

5. Bundling is a form of price discrimination because

a) Firm refuses to sell its products separately
b) Customers are aware of firm's intentions
c) Customers who purchase the bundle do so because there is no better alternative in the market
d) Customers who purchase the bundle value the components of the bundle at different levels
e) Customers who cannot purchase the bundle are discriminated against

6. A and B are two firms profitably operating in a perfectly competitive industry. B's scale is bigger than A's.

a) If price drops, A's profit will drop by a bigger amount than B's profit.
b) As price drops, B will be driven out of the industry before A.
c) B can have some control over its price but A cannot
d) Neither A nor B has control over the price
e) none of the above

A

B ⟶ bigger Scale

Numeric Questions:

7. A perfectly competitive market has the industry demand as follows:

P=50,000-6Q

There are one thousand identical firms (call each type A firm), each with the following total cost function:

$TC_A = 20,000+2,500Q^2$

HORIZONTAL ADDITION!!!

LOL

a) (10 points) What is the equilibrium price? How many units are produced and sold in this industry?

10

$$\text{Supply} = \text{Demand}$$

$$\text{Demand} = 50,000 - 6Q = P$$

$$\text{Supply} = \overset{1000}{\underset{0}{\Sigma}} MC$$

$$MC = 5000 \, Q = P$$

$$Q = \frac{P}{5000} \times 1000 = \frac{P}{5}$$

$$P = 5Q$$

$$50,000 - 6Q = 5Q$$

$$11Q = 50,000 \quad \boxed{\begin{array}{l} Q = 4,545.45 \\ P = \$22,727.27 \end{array}}$$

b) (10 points) What is the profit of each type A firm?

10

$$\text{Profit} = TR - TC$$

$$\overset{P}{TR} = \$22,727.27 \overset{*}{*} \overset{Q}{4.55} = \$103,305.68$$
$$\text{(each Industry)}$$

$$TC = TFC + TVC$$

$$20,000 + 2,500(4.55)^2 = \$71,756.25$$

$$TR - TC = \boxed{\$31,549.43}$$

c) (10 points) There are 50 firms entering this market, each type B with the following total cost function:

10

$TC_B = 10,000 + 2,500Q^2$

What is the new market price? Supply = Demand. Predict Price will be lower!

Still horizontal addition.

$TC = 10,000 + 2,500Q^2 \quad MC = 5000Q = P$

$Q = \frac{P}{5000} \times 1050$ firms now since cost of A+B is same!

Supply increases!

$Q = .21P \quad P = 4.76Q \quad 50,000 - 6Q = 4.76Q \quad Q = 4646.02$

$10.76Q = 50,000 \quad \boxed{P = \$23123.89}$ INDUSTRY

d) (10 points) What do you think will happen in this industry in the LONG RUN and WHY?

8

In the long run, other firms will see the profit that type A firm and type B firm is making - thus wanting to join this market. As other firms join this market to capture profit, supply will increase, thus decreasing price → decreasing profit until revenue for the industry in this perfectly competitive market will be ZERO.
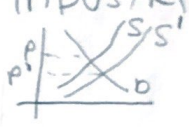
8. (16 points) Gabriel wants to invest at least $1,000 each year for the coming 5 years. (First investment is today and last investment is 5 years from today). Interest rate is 10% per year. He decides to invest $1,000 today and would like to increase his investment by $x every year up to his last investment. To be able to accumulate a total of $10,000 ten years from today, what should be x?

10

FOR SURE

1000 1000 1000 1000   1000
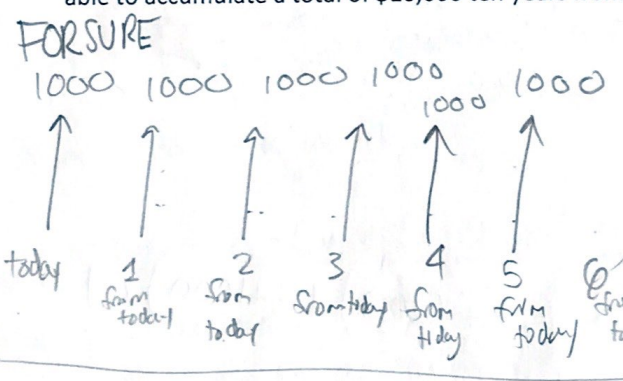
1000

$i = 10\%$ PER YEAR

Get $10K in future Value!

today   1   2   3   4   5   6   7   8   9   10

$$1000(1.1)^{10} + (1000+x)(1.1)^{9} + (1000+2x)(1.1)^{8} + (1000+3x)(1.1)^{7}$$

$$+(1000+4x)(1.1)^{6} + (1000+5x)(1.1)^{5} = \$10,000 \qquad \text{Solve for X, and we win!} \Rightarrow \text{Flip !!!}$$

Seporate?

9. Batsam and Jetsam are two investors. Both are presented with an opportunity that has the following cash flow:

Opportunity cost *2?

Years	Cash Flow
0	-10,000
1	12,000
2	4,000

Different!
Cannot Compare.

That is, if you pay $10,000 today, you will receive $12,000 in one year and $4,000 in two years.

Batsam has only $5,000 and can borrow at 5% and lend at 7% in the market.
Jatsam has $10,000 and can borrow and lend at 6% in the market.

10   BRING EVERYTHING TO YEAR TWO DOLLARS!

a) (10 points) What is the value of this opportunity to Jetsam and Batsam in today's dollars?

Batsam does Opportunity | Batsam lends in market "opportunity cost" | Jatsam does Opportunity | Jatsam lends in market "opportunity cost"

— Borrows 5,000
  — owes 5250 at end of year

TODAY DOLLARS
Year 0

$$-10,000 + \frac{12000}{(1+.06)} + \frac{4000}{(1+.06)^2}$$

$$= \$4880.74 \text{ for Jetsam}$$

$$-10,000 + \frac{12000}{(1+.07)} + \frac{4000}{(1+.07)^2}$$

$$= \$4708.71 \text{ for Batsam}$$

b) (10 points) If both end up investing on this deal, how much __economic profit__ will each make in today's dollars? (Hint: Please note that, if they need to borrow money, you can assume any possible payment plan, the payment plan you choose does not affect the answers to above questions!)

4

Profit = TR − TC − Opportunity Costs
          "next best thing"

$10,000 * (1.06)^2 — year 2 dollars
        $11236

Jetsam's economic profit
= -10,000 *... +4000(1.06) + ...

Revenue − TC − Opportunity Cost = $12,000 * 1.06 + 4000 - 10,000 * 1.06^2 (−10,000 + 1.06^3)
                                        yr2   yr2   yr2   yr2
                                                                                +10,000
                                                                              = 4248
                                                                              Bring BACK
                                                                              to year ①

Batsam's Economic Profit:
Payment Plan: Return at end of year 2

Batsam's Opportunity Cost:
$5,000 (1.07)^2 = 5724.5

5,000 − 5512.5 $\frac{12,000}{(1+.07)} + \frac{4000}{(...)}$

Bring back to year 0
$\frac{4879}{1.07^2}$ = $4261.5 Batsam

Revenue − TC − Opportunity Cost

$$12,000 (1.07) + 4000 - 5,000 * 1.07^2 - 5,000 * 1.05^2 (-5,000*1.07) = 4879$$
                                                          +5,000

$\frac{4248}{1.06^2}$ Jetsam
= $3780.7

Separate?

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opportunity cost *2?

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- Borrows 5,000
  - owes 5250 at end of year

TODAY DOLLARS year 0

$-10,000 + \frac{12000}{(1+.06)} + \frac{4000}{(1+.06)^2}$

$= 4880.74 for Jetsan

$-10,000 + \frac{12000}{(1+.07)} + \frac{4000}{(1+.07)^2}$

$= 4708.1 for Batsa

b) (10 points) If both end up investing on this deal, how much economic profit will each make in today's dollars? (Hint: Please note that, if they need to borrow money, you can assume any possible payment plan, the payment plan you choose does not affect the answers to above questions!)

4

Profit = TR - TC - Opportunity Costs
"next best thing" $10,000 * (1.06)^2$ year 2 dollars
↓ $11236

Jetsam's economic profit

Revenue - TC - Opportunity Cost = $12,000 * 1.06 + 4000 - 10,000 * 1.06^2 (-10,000 +)$
                                                                                    +10,000
                                                                                    = 4248

Batsam's Economic Profit:
Payment Plan: Return at end of year 2.

Batsam's Opportunity Cost:
$5,000 (1.07)^2 = 5724.5$ Bring BACK

$5,000 - 5512.5$ $\frac{12,000}{(1+.07)} + \frac{4000}{(1+.07)^2}$ Bring back to year 0 $\frac{4879}{1.07^2} = 4261.5 .5 = to year 0
                                                                                            Batsam

Revenue - TC - Opportunity Cost

$12,000 (1.07) + 4000 - 5,000 * 1.07^2 - 5,000 * 1.05^2 (-5,000 * 1.07) = 4879$
                                                    +5,000

$\frac{4248}{1.06^2}$ Jetsam
$= 3780.7

10% Compound Interest Factors **10%**

	Single Payment		Uniform Payment Series				Arithmetic Gradient		
	Compound Amount Factor	Present Worth Factor	Sinking Fund Factor	Capital Recovery Factor	Compound Amount Factor	Present Worth Factor	Gradient Uniform Series	Gradient Present Worth	
	Find F Given P	Find P Given F	Find A Given F	Find A Given P	Find F Given A	Find P Given A	Find A Given G	Find P Given G	
n	F/P	P/F	A/F	A/P	F/A	P/A	A/G	P/G	n
1	1.100	.9091	1.0000	1.1000	1.000	0.909	0	0	1
2	1.210	.8264	.4762	.5762	2.100	1.736	0.476	0.826	2
3	1.331	.7513	.3021	.4021	3.310	2.487	0.937	2.329	3
4	1.464	.6830	.2155	.3155	4.641	3.170	1.381	4.378	4
5	1.611	.6209	.1638	.2638	6.105	3.791	1.810	6.862	5
6	1.772	.5645	.1296	.2296	7.716	4.355	2.224	9.684	6
7	1.949	.5132	.1054	.2054	9.487	4.868	2.622	12.763	7
8	2.144	.4665	.0874	.1874	11.436	5.335	3.004	16.029	8
9	2.358	.4241	.0736	.1736	13.579	5.759	3.372	19.421	9
10	2.594	.3855	.0627	.1627	15.937	6.145	3.725	22.891	10
11	2.853	.3505	.0540	.1540	18.531	6.495	4.064	26.396	11
12	3.138	.3186	.0468	.1468	21.384	6.814	4.388	29.901	12
13	3.452	.2897	.0408	.1408	24.523	7.103	4.699	33.377	13
14	3.797	.2633	.0357	.1357	27.975	7.367	4.996	36.801	14
15	4.177	.2394	.0315	.1315	31.772	7.606	5.279	40.152	15
16	4.595	.2176	.0278	.1278	35.950	7.824	5.549	43.416	16
17	5.054	.1978	.0247	.1247	40.545	8.022	5.807	46.582	17
18	5.560	.1799	.0219	.1219	45.599	8.201	6.053	49.640	18
19	6.116	.1635	.0195	.1195	51.159	8.365	6.286	52.583	19
20	6.728	.1486	.0175	.1175	57.275	8.514	6.508	55.407	20
21	7.400	.1351	.0156	.1156	64.003	8.649	6.719	58.110	21
22	8.140	.1228	.0140	.1140	71.403	8.772	6.919	60.689	22
23	8.954	.1117	.0126	.1126	79.543	8.883	7.108	63.146	23
24	9.850	.1015	.0113	.1113	88.497	8.985	7.288	65.481	24
25	10.835	.0923	.0102	.1102	98.347	9.077	7.458	67.696	25
26	11.918	.0839	.00916	.1092	109.182	9.161	7.619	69.794	26
27	13.110	.0763	.00826	.1083	121.100	9.237	7.770	71.777	27
28	14.421	.0693	.00745	.1075	134.210	9.307	7.914	73.650	28
29	15.863	.0630	.00673	.1067	148.631	9.370	8.049	75.415	29
30	17.449	.0573	.00608	.1061	164.494	9.427	8.176	77.077	30
31	19.194	.0521	.00550	.1055	181.944	9.479	8.296	78.640	31
32	21.114	.0474	.00497	.1050	201.138	9.526	8.409	80.108	32
33	23.225	.0431	.00450	.1045	222.252	9.569	8.515	81.486	33
34	25.548	.0391	.00407	.1041	245.477	9.609	8.615	82.777	34
35	28.102	.0356	.00369	.1037	271.025	9.644	8.709	83.987	35
40	45.259	.0221	.00226	.1023	442.593	9.779	9.096	88.953	40
45	72.891	.0137	.00139	.1014	718.905	9.863	9.374	92.454	45
50	117.391	.00852	.00086	.1009	1163.9	9.915	9.570	94.889	50
55	189.059	.00529	.00053	.1005	1880.6	9.947	9.708	96.562	55
60	304.482	.00328	.00033	.1003	3034.8	9.967	9.802	97.701	60
65	490.371	.00204	.00020	.1002	4893.7	9.980	9.867	98.471	65
70	789.748	.00127	.00013	.1001	7887.5	9.987	9.911	98.987	70
75	1271.9	.00079	.00008	.1001	12709.0	9.992	9.941	99.332	75
80	2048.4	.00049	.00005	.1000	20474.0	9.995	9.961	99.561	80
85	3299.0	.00030	.00003	.1000	32979.7	9.997	9.974	99.712	85
90	5313.0	.00019	.00002	.1000	53120.3	9.998	9.983	99.812	90
95	8556.7	.00012	.00001	.1000	85556.9	9.999	9.989	99.877	95
100	13780.6	.00007	.00001	.1000	137796.3	9.999	9.993	99.920	100