

1102-Microeconomics
Second Final

Maria Antonieta da Cunha e Sá
Bruno Martins
Doruk Iris

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2.30-4.30pm

Warnings

1. Calculators or any other electronic devices are not allowed.
2. No questions are answered during the test.

Honor's Commitment

I declare that I will neither use nor contribute, directly or indirectly, to any illegal procedure or fraud during this test.

Signature: _____

Good Luck!

Solution Topics

Name: _____ Nº: _____

I
(3)

Suppose a representative firm in a perfectly competitive, constant-cost industry has a cost function

$$TC = 4q^2 + 100q + 100$$

(a) What is the long-run equilibrium price for this industry?

1 point

$$\min_{q^s} AVC \Rightarrow \min_{q^s} 4q + 100 + \frac{100}{q}$$

$$\text{FOC: } 4 - \frac{100}{q^2} = 0 \Leftrightarrow q^2 = \frac{100}{4} \Leftrightarrow \boxed{q = 5}$$

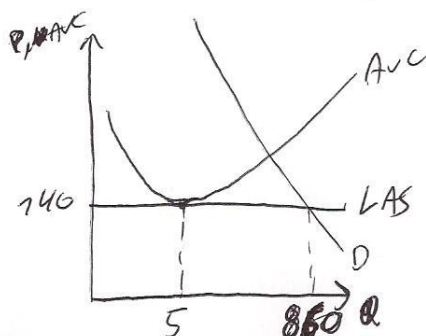
$$P = AVC \Leftrightarrow P = 4 \times 5 + 100 + \frac{100}{5} = 140$$

0,75

(b) If market demand is given by $Q^d = 1000 - P$, where P denotes price, how many firms will operate in this long-run equilibrium? Illustrate graphically.

$$\text{If } P = 140 \Rightarrow Q^d = 1000 - 140 = 860$$

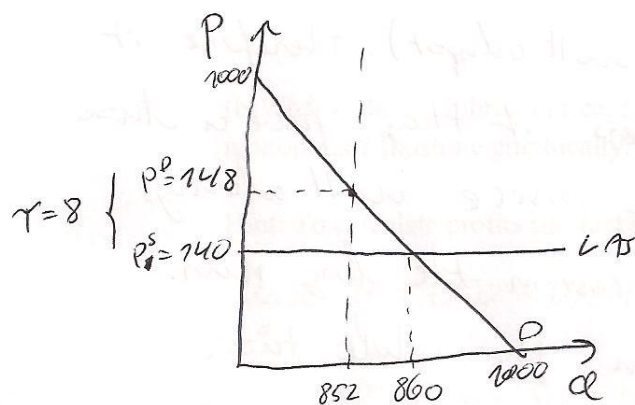
$$nq = Q \Leftrightarrow n = \frac{Q}{q} = \frac{860}{5} = 172$$



0.75

(c) Suppose the government imposes a tax of 8 euros per unit of output. What would be the new long-run equilibrium price for the industry? Illustrate graphically.

Price for producers does not change ($p^s = 140$)
since in the long run the aggregate supply
is horizontal at the minimum of the
average cost.



consumers will
pay $140 + 8 = 148$

0.5

(d) Who are the winners and the losers following the imposition of the tax in (c)? Explain briefly.

- Producers stay the same, their profits are still equal to zero.
- Consumers lose since they face a higher price.

$$\Delta CS = - \left(8 \times 852 + \frac{8 \times 8}{2} \right) = -6848$$

- Government wins $8 \times 852 = 6816$ of revenue

Producers stay the same because the market adjusts such that they'll have zero profits (the price they receive will adjust). therefore it doesn't matter for producers if they face a tax or not since the producer price will always be driven to the Average cost in the long run. Consumers will, then, bear the whole tax.

II
(7)

Consider a firm which has the following cost function:

$$TC = 500 + 20q$$

The market demand function is given by $Q^d = 100 - 2P$.

1 point

(a) Show, formally, that this firm is a natural monopolist.

Sufficient condition: Decreasing Avg Cost.

$$\text{Avg } C = \frac{500}{q} + 20$$

$$\frac{\partial \text{Avg}}{\partial q} = -\frac{500}{q^2} < 0 \quad \checkmark$$

(b) What is the equilibrium price, quantity produced and the profits for this monopolist? Illustrate graphically. Is the market efficient?

1,5

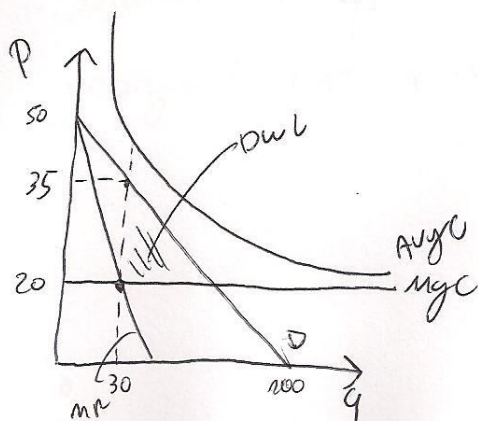
Hint: To calculate profits subtract costs from revenues.

$$\max_q \pi = (50 - 0,5q)q - 20q - 500$$

$$\text{FOC: } \frac{d\pi}{dq} = 0 \Rightarrow 50 - q - 20 = 0$$

$$\Rightarrow q^m = 30 \quad ; \quad p^m = 50 - 0,5 \times 30 = 35$$

$$\pi = 35 \times 30 - 20 \times 30 - 500 = -50$$

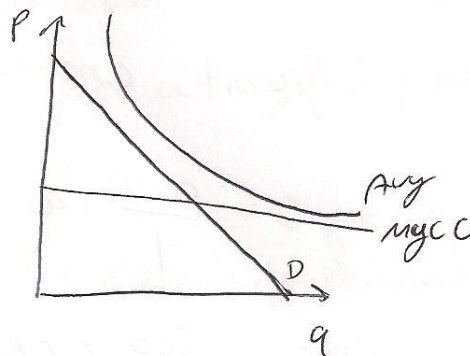


The market is not efficient since the fact that price is above marginal cost generates DWL

Suppose now that the market is regulated and the price is set by the regulator.

- 1 (c) If the price is set at average cost, what is the monopolist's profit? Is the market efficient? Illustrate graphically.

$$\begin{aligned}\pi &= PQ - TC \\ &= PQ - \text{AvgC} \cdot q \\ &= \text{AvgC} \cdot q - \text{AvgC} \cdot q \\ &= 0\end{aligned}$$



The market is not efficient since the price is above marginal cost.

- 1 (d) If the price is set at marginal cost, what is the price, quantity and the monopolist's profit?

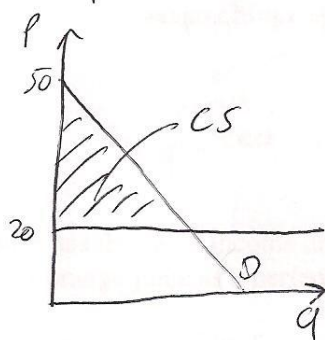
$$\begin{aligned}P &= \text{MgC} = 20 \\ Q &= 100 - 2 \times 20 = 60 \\ \pi &= 60 \times 20 - 20 \times 60 - 500 = -500\end{aligned}$$

Additionally, assume that there are 10 consumers with identical individual demands.

1.5

(e) Consider a two-part pricing. Each consumer must pay a fixed fee regardless of consumption level plus a price per unit. If the price per unit is set equal to marginal cost, what is the largest fee that a consumer would pay for the right to buy at that price?

$$\text{Expenditure} = \text{Fee} + 20q$$



$$CS_T = \frac{(50 - 20) \cdot 60}{2} = 900$$

$$CS_i = \frac{900}{10} = 90$$

The largest fee a consumer would be willing to pay is 90.

1

(f) In this case, can the firm break-even? Is the market efficient?

Since $\frac{900}{\text{Fee}} > \frac{500}{\text{FC}}$, the firm

can break-even ($\pi \geq 0$)

market is efficient since we have marginal cost pricing (thus no DWL)

III

(7)

1. Maria spends 6€ per week on orange juice and apple juice. Orange juice costs 2€ per cup while apple juice costs 1€ per cup. Maria views 1 cup of orange as a perfect substitute for 3 cups of apple juice.

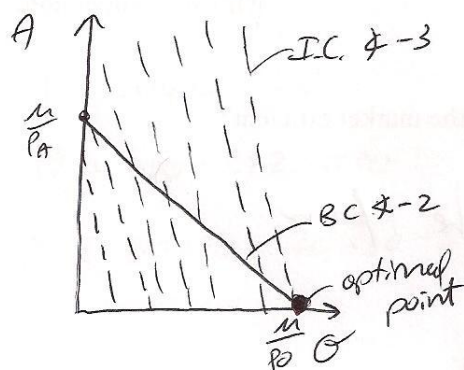
0,5 points

(a) Write down a utility function that represents Maria's preferences.

$$U = 3O + A$$

1

(b) Find Maria's optimal consumption bundle of orange juice and apple juice each week. What is the level of utility at the optimum? Illustrate graphically.



$$MRS_{O,A} = \frac{dU/dO}{dU/dA} = 3 \rightarrow \text{Perfect substitutes}$$

$$(O^*, A^*) = \left(\frac{6}{2}, 0\right) = (3, 0)$$

$$U(O^*, A^*) = 3 \times 3 + 0 = 9$$

- 1 (c) Suppose the price of apple juice rises to 2€ per cup, while the price of orange juice remains the same. How much additional income would Maria need to afford the original consumption bundle?

nothing. The initial bundle is still affordable with the new prices.
The Initial bundle now requires an Income:
$$2 \times A^* + 2 \times O^* = 2 \times 0 + 2 \times 3 = 6 = M^{\text{Initial}}$$

Final prices (ITS CV's (old))

2. José has the same income and faces the same prices as Maria in (a), but he views 1 cup of orange juice as a perfect substitute for 1 cup of apple juice.

0,25

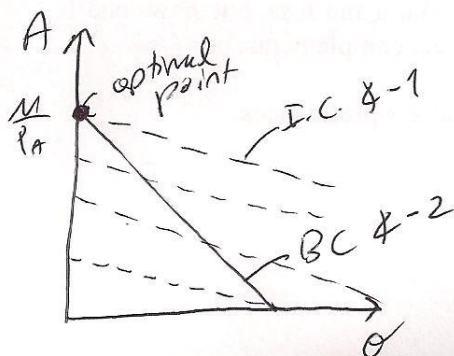
- (a) Write down a utility function that represents José's preferences.

$$V = A + O$$

- (b) Find José's optimal consumption bundle. What is the level of utility at the optimum? Illustrate graphically.

0,75

$MRS = 1 \rightarrow$ Perfect substitutes



$$(O^*, A^*) = (0, \frac{M}{P_A})$$

$$= (0, \frac{6}{2}) = (0, 3)$$

$$V(O^*, A^*) = 0 + 6 = 6$$

1

- (d) How much additional income would José need to be able to afford his original consumption bundle when the price of apple juice doubles?

The new bundle requires

$$2 \times A^* + 2 \times O^* = 2 \times 6 + 2 \times 0 = 12 = m'$$

$$\Delta m = 12 - 6 = 6$$

(CV slusky)

3. Teresa has the income and faces the same prices as Maria and José, but views one 1 cup of orange juice and one cup of apple juice as perfect complements.

0.5

- (a) Write down a utility function that represents José's preferences.

$$U = \min\{O, A\}$$

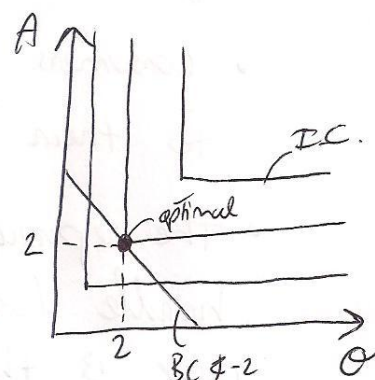
- (b) Find Teresa's optimal consumption bundle. What is the level of utility at the optimum? Illustrate graphically.

1

At the optimal point:

$$\begin{cases} A = 0 \\ 2\theta + A = 6 \end{cases} \Leftrightarrow \begin{cases} A^* = 2 \\ \theta^* = 2 \end{cases}$$

$$U(\theta^*, A^*) = \min\{2, 2\} = 2$$



- (c) How much additional income would Teresa need to afford her original consumption bundle when the price of apple juice doubles?

1

$$2 \times A^* + 2 \times \theta^* = 2 \times 2 + 2 \times 2 = 8 = m'$$

$$\Delta m = 8 - 6 = 2$$

IV
(3)

If you have ever gone grocery shopping on a weekday afternoon, you have probably noticed some elderly shoppers going slowly down the aisles checking their coupon book for a coupon that matches each of their purchases. How is this behaviour explained by the hurdle model of (second-degree) price discrimination?

Key Aspects:

- Consumers separate themselves according to their price elasticities
- The separation is achieved through a hurdle (or a mechanism) which in this case is the coupon (they have to carry them and looking for matches)
- Consumers with low price elasticities do not jump the hurdle and pay a higher price. Consumers with ~~a~~ high price elasticities pay a lower price.