1102-Microeconomics

Second Midterm

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5.-6.30pm

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
(5)

Consider a firm that produces good Y using labor, L, and capital, K, according to the following production function:

$$Y = \ln(L) + K$$

2 a) Formalize the producer's problem and derive the conditional demand functions for the inputs.

$$\min_{\{L,K\}} TC = wL + rK \quad \text{s.to} \quad \bar{y} = \ln(L) + K$$

$$\begin{cases} |MRTS|_{L,K} = \frac{w}{r} \\ \bar{y} = \ln(L) + K \end{cases} \Leftrightarrow \begin{cases} \frac{\frac{1}{L}}{1} = \frac{w}{r} \\ \text{---} \end{cases} \Leftrightarrow \begin{cases} L^* = \frac{r}{w} \\ \bar{y} = \ln\left(\frac{r}{w}\right) + K \end{cases}$$

$$\Leftrightarrow \begin{cases} L^* = \frac{r}{w} \\ K^* = \bar{y} - \ln\left(\frac{r}{w}\right) \end{cases}$$

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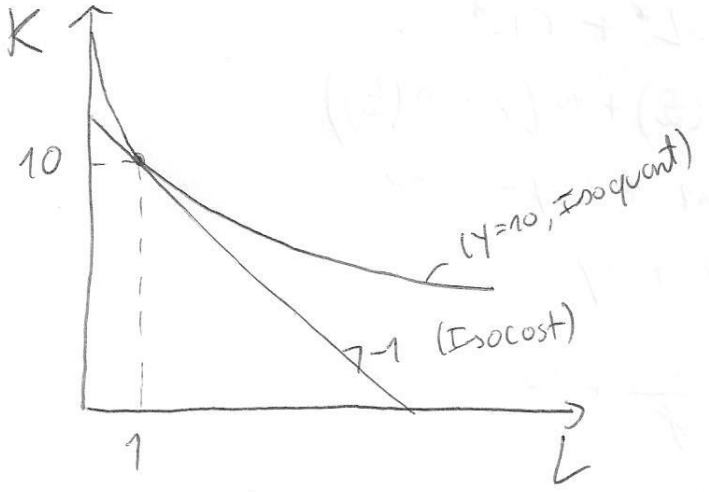
b) Suppose the firm needs to produce 10 units of output. Knowing that $w = r = 10$, what is the optimal combination between the inputs? Represent the optimal choice graphically in the (L,K) space.

$$L^* = \frac{Y}{w} = \frac{10}{10} = 1$$

$$K^* = \bar{Y} - \ln\left(\frac{Y}{w}\right) = 10 - \ln(1) = 10$$



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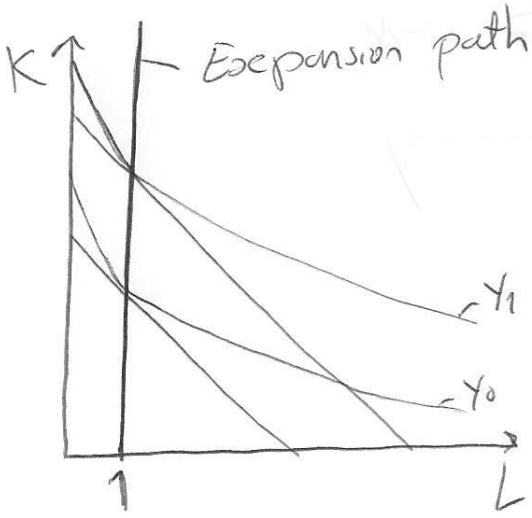
c) Represent graphically the expansion path.

L is always 1 regardless of $\bar{Y}$:



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1,5 d) Derive the expression for the total cost function. Obtain and represent graphically the marginal cost curve and the average cost curve.

$$TC = wL^* + rK^*$$

$$= 10\left(\frac{r}{w}\right) + 10\left(Y - h\left(\frac{r}{w}\right)\right)$$

$$= 10 \times 1 + 10Y - 10 \times 0$$

$$= 10 + 10Y$$

$$AvgTC = \frac{10}{y} + 10$$

$$MgTC = 10$$

II
(8)

Let

$$TC = 8 + 2q + 2q^2$$

represent the total cost of each of the 20 perfect competitive firms in the market of wool fiber. Also, the market demand is given by

$$p = 50 - Q$$

where p represents the unitary price and Q the aggregate demand.

2 (i)Assuming that the industry is in long-run equilibrium, obtain the equilibrium for each firm and for the market. Illustrate graphically.

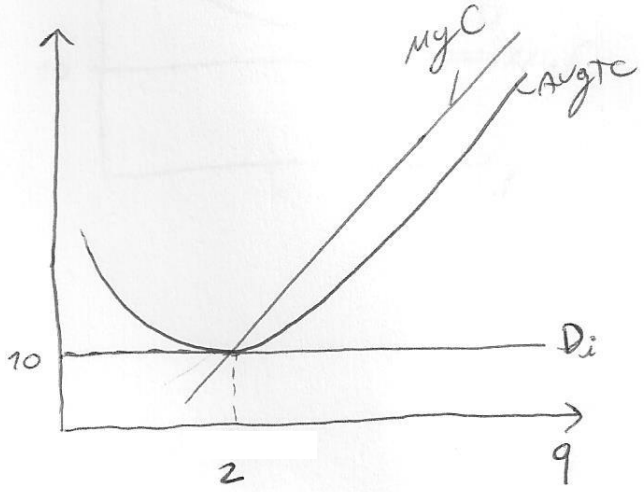
$\min_q AvgTC \Leftrightarrow \min_q \frac{8}{q} + 2 + 2q$

$\frac{dAvgTC}{dq} = 0 \Leftrightarrow -\frac{8}{q^2} + 2 = 0 \Leftrightarrow q^* = 2$

$Q^* = 2 \times 20 = 40$

$P^* = 50 - 40 = 10$

$\pi = 0$



2 (ii) What is the short-run supply for the industry? Illustrate graphically.

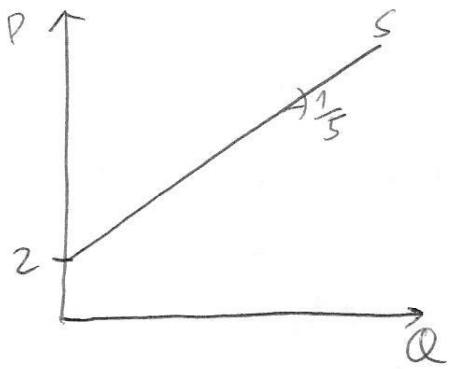
$\max_q \; pq - TC$

$\rightarrow p = MgC \Leftrightarrow p = 2 + 4q$ (supply for one firm, always above Avg VC)

$p = 2 + 4q \Leftrightarrow q = \frac{p-2}{4} \Rightarrow Q = 20q = \frac{20}{4}(p-2)$

$\Leftrightarrow Q = 5p - 10$

$\Leftrightarrow p = 2 + \frac{Q}{5}$



2 (iii) Imagine now that the country where this industry is located is under intervention of IMF (International Monetary Fund) due to serious financial crisis. Following this intervention, consumption decreased significantly, implying that the new market demand for the industry is now

$$p = 38 - Q$$

Obtain the short-run equilibrium (price, number of firms, quantity produced by each firm, quantity demanded), that is, immediately after the IMF intervention. Illustrate graphically.

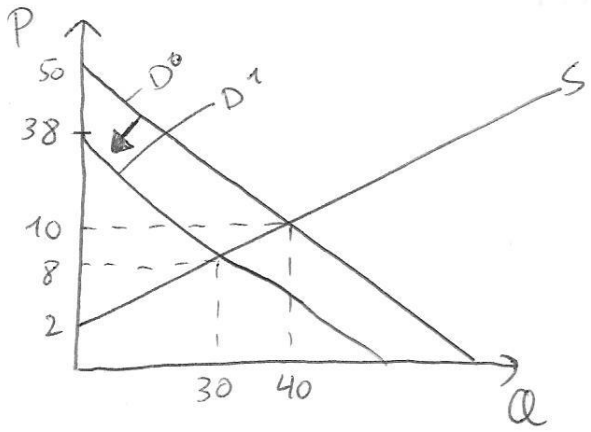
$D = S \Leftrightarrow 38 - Q = 2 + \frac{Q}{5}$ or $38 - p = 5p - 10$

$\Leftrightarrow 6p = 48 \Leftrightarrow p^* = 8$

$Q^* = 30$

$q^* = \frac{30}{20} = 1{,}5$

$n = 20$



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0,75 (iv) Is the equilibrium found in (iii) a long-run equilibrium for the industry? Why?

$\Pi = Pq - TC = 8 \times 1{,}5 - (8 + 2(1{,}5) + 2(1{,}5)^2) = -3{,}5$

Not a long-run equilibrium because profits are negative ⇒ Incentives for firms to leave the market

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(v) Obtain the new long-run equilibrium for the industry and explain the consequences of the IMF intervention for this industry.

$\min_q AvgTC \Rightarrow q = 2$ and $p = 10$

$Q = 38 - p \Leftrightarrow Q^* = 28$

$Q = nq \Leftrightarrow n^* = \frac{28}{2} = 14$

$\pi = 0$

the number of firms in the market is smaller and profits go back to zero. total quantity in the market is lower.

III
(7)

A struggling unique Heavy Metal band is currently considering recording a CD. The unitary production costs are 20€.
Due to its small but loyal number of fans, the band estimates that the CD would face the following demand: P=100-Q

2 a) Suppose that you are hired as the band manager. How many units of CDs would you advise the band to produce? At which price?

$\max_{Q} P(Q)Q - 20Q$

F.O.C $\Rightarrow MR = MC \Leftrightarrow 100 - 2Q = 20 \Leftrightarrow Q = 40$

$P = 100 - 40 = 60$

2 b) In order to save on the production of CDs, a band member proposes that they should be available for purchase only online. In this case, the band only incurs into a fixed cost of 300€, with no costs per CD. Which distribution channel would you advise the band to use, physical or digital? Explain briefly.

Physical: $\pi = 60 \times 40 - 20 \times 40 = 1600$

Digital: $MR = MC \Leftrightarrow 100 - 2Q = 0 \Leftrightarrow Q = 50$

$P = 50$

$\pi = 50 \times 50 - 300 = 2200$

Using the digital channel would be better because profits are higher.

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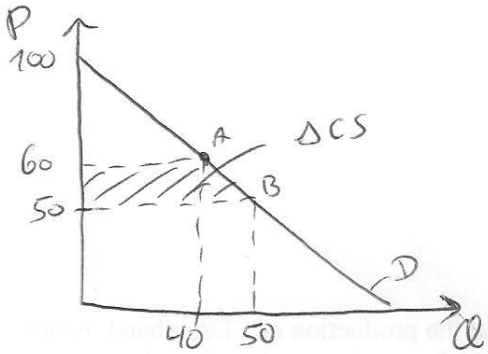
c) Which distribution channel would make fans better off? By how much? Explain. Illustrate graphically.

Physical: $CS = \frac{(100-60)40}{2} = 800$ (A)

Digital: $CS = \frac{(100-50)50}{2} = 1250$ (B)

Digital channel makes the fans better off by $(1250 - 800) = 450$



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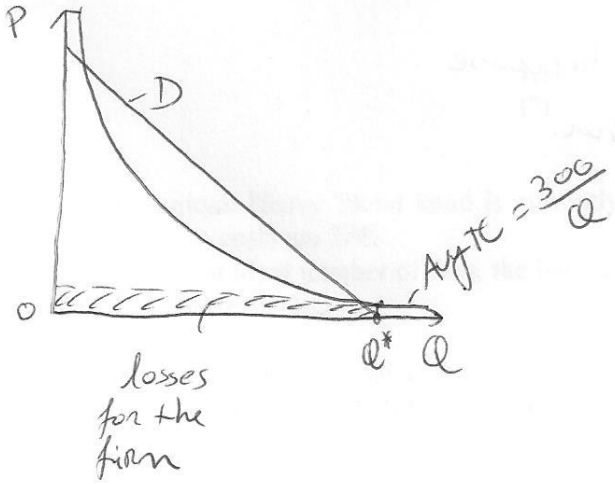
d) What would be the price that maximizes market welfare in each of the distribution channels? Is this feasible? Illustrate graphically and explain the results obtained.

$P = MgC$

Not feasible in the Digital channel because MgC is zero and thus a price of zero cannot cover the fixed cost.



It is possible in the physical channel because the profits would be zero:

$$\Pi = PQ - MgC\,Q \quad \text{(no fixed costs)}$$

$$= (MgC - MgC)Q = 0$$