

Economics 431
Winter 2002
First Midterm Exam
February 11, 2002

Print your name here _____

Your UM ID number¹ _____

Instructions:

- Do not open the exam until you are told to do so.
- *Once the exam begins*, check that you have all the pages. There should be 12 pages including this one.
- *Once the exam begins*, print your name in capital letters on top of each page to receive credit for it.
- This is a closed book, closed notes exam.
- You have 1 hour and 20 minutes minutes to take the exam.
- Answer the questions in the space provided. To get credit on word questions, you should provide a brief explanation of your answer. Please write concisely and to the point. Feel free to use diagrams, but label them properly. If your answer involves doing math, show all work (this way you will get partial credit in case your ideas are correct but your math is not).
- If you run out of space on a particular question, you may use the back side of the same page. Clearly indicate on the front of the page that your answer is on the back; and on the back, give the number of question you are answering.

Good Luck!

¹The underlined 8 digits on the face of your M-Card

Part I True or false (credit given for explanation and/or explicit calculation)

1) (8 points) Consider a competitive industry with identical firms (in equilibrium). If the fixed costs of all firms go up, the concentration ratio CR_4 has to go up in the new long-run equilibrium

2) (7 points) As long as consumers are willing to pay a positive price for the good, the larger is the quantity produced, the larger is the total surplus from trade.

3) (7 points) It costs the local telephone company \$2 per month to provide caller ID service to a household. Elasticity of demand for caller ID service equals $-\frac{4}{3}$ (at any price). Then the telephone company will make more money if it offers caller ID at \$5 a month than if it offers this service at \$8 a month.

4) (8 points) Grocery stores typically have a 10% senior citizen discount, but some tanning salons offer as much as 25%. This must be because the pressure for companies to look charitable is much higher in the services industry than in retail.

Part II Long questions (Show all work)

5) (20 points) An industry consists of many identical firms. Each firm's total cost function is

$$C(q) = \frac{1}{8} + \frac{1}{2}q^2$$

and each firm's supply curve is

$$p = q$$

where p is the market price and q is quantity supplied.

a) **(10 points)** What is the market price in the *long-run* equilibrium?

b) **(6 points)** Suppose that $Q^* = 100$ units of the good are sold in this long-run equilibrium. What is the equilibrium number of firms in the industry?

c) **(4 points)** What is the Herfindahl index for this industry? (If you did not get part *b*), simply assume that the number of firms is equal to N and leave your answer in letters)

6) (20 points) The same textbook that sells for \$ 70 in the US sells for \$ 5 in India. Suppose you know that if the publisher were to offer this book for the same (uniform) price in the two countries, *no one* in India would buy the book. Assume that the textbook is not offered outside of US and India.

a) **(10 points)** If the publisher had to charge the same price in both countries, what would it be? Are the US consumers harmed by price discrimination in this case? Explain.

b) **(10 points)** Assume that the publisher's costs are exactly the same in either country. Let the elasticity of demand for the textbook in the US be $-\frac{35}{34}$. What is the elasticity of demand for this textbook in India?

7) (20 points) VoiceAce is a manufacturer of unique voice recognition software sold to home and business users. The software is offered in two versions, the Regular with the vocabulary of 20,000 words and the Deluxe with the vocabulary of 50,000 words.

Business customers (B) value each word in the software's vocabulary at $v_B = 1.5$ cents (\$0.015) whereas home use customers (H) value each word at 0.8 cents (\$0.008). That is, if customer of type i (i is either B or H) has a voice recognition software with a vocabulary of q words and pays a price p for it, her utility is

$$U_i = v_i q - p.$$

a) **(10 points)** Suppose that VoiceAce wants to sell the Regular version to the home use customers and the Deluxe version to the business customers, but cannot tell the customer types apart. What prices should VoiceAce charge for the two versions of software?

b) **(10 points)** Suppose VoiceAce can make either one version or two versions of the software at the *same* cost. Will VoiceAce always find it profitable to offer two versions of the software? Explain. What fraction of VoiceAce total sales (by quantity) must be to home use customers in order for it to offer two versions of the software?

8) (20 points) Popsico Inc is a soda manufacturer. The customers who buy Popsico soda have different tastes y for sugar content, with y ranging from 0 to 1. For each y , there is an equal density of customers with taste y . If y is the customer's most preferred sugar content, and the drink has sugar content x , then customer y is willing to pay

$$1 - 0.4|y - x|$$

for the can of soda. The marginal cost of producing one can of soda of any sugar content is equal to $c = 0.1$. Assume that the manufacturer always serves all the market.

a) **(5 points)** When you take over as the CEO of Popsico, it manufactures just one type of soda, the Thirstbuster, with sugar content $x = \frac{1}{2}$. Assume that the fixed cost of introducing this product has been already paid in full. What price per can will you set?

b) (**5 points**) Suppose that your product manager proposes a complete product line overhaul. In particular, his plan is to eliminate the Thirstbuster altogether and to offer two new types of soda instead: Thirstbuster-lite and Thirstbuster-sweet. Each product type will cost $F = 0.04$ to introduce (this fixed cost is measured in flow terms). What must be the sugar contents of the new products and their prices in order to maximize profit? Is this project going to raise Popsico's profits and, if so, by how much? When doing net profit calculations, continue to assume that producing the old product, the Thirstbuster, entails zero fixed costs.

c) **(10 points)** A guy from BigShot Consulting suggests that Popsico can make even more money (compared to part *b*) if instead of completely overhauling the product line the company keeps selling the Thirstbuster ($x = \frac{1}{2}$) and introduces *just one* other product. This, he reasons, will save some of the fixed costs. If Popsico were to introduce just one other soda, what would the sugar content be? Would the Thirstbuster be offered at the same price as in part *a*)? What is the market share for the new product going to be? Whose plan results in higher profits for Popsico: the product manager's (in part *b*) or the consultant's? When doing profit calculations, assume that $F = 0.04$ and that consumers who are indifferent between two drinks, will purchase the one closest to their taste.

Reference guide

Derivatives of some functions

$$\begin{aligned}\frac{d}{dx}(x^2) &= 2x \\ \frac{d}{dx}\left(\frac{1}{x}\right) &= -\frac{1}{x^2}\end{aligned}$$

Marginal revenue for a monopolist

$$\frac{d}{dq}(p(q) \cdot q) \equiv MR(q) = p(q) \cdot \left(1 - \frac{1}{\eta(p)}\right),$$

where $p(q)$ is the market price when quantity sold is q and

$$\eta(p) = \left| \frac{dQ_D}{dp} \cdot \frac{p}{Q_D} \right|$$

is the positive of the elasticity of demand.