

Spring 1995
14.01 Exam 1
Professor Jeffrey Harris
Instructions

1. This is a closed book exam. In addition, no calculators are to be used. On the cover of each exam booklet, please write:
 - The number of the question you are answering
 - Your name
 - Your ID number
 - The name of your instructor (List your Friday recitation instructor if you go to Professor Harris's lectures)
 - The time your class meets
2. In case you have forgotten your instructor's name or the correct spelling, here is a list with class times.

Rabindran Abraham (MWF 1, F 12)
Jason Abrevaya (MWF 12)
Matt Barmack (MWF 1)
Meghan Busse (MWF 11, 12)
Kobsak Pootrakool (F 10, 11)
Dan Rodriguez (MWF 9, 12, F 10)
Amit Solomon (MWF 9,11)
3. There are four questions on the exam. Answer all questions. You have 2 hours to complete the exam. The exam will be graded out of a total of 90 points. The point value of each question is listed in the exam and also gives you a guideline for how long you should spend answering the question.
4. Please do not start working on the exam until the proctors announce you may begin. Please hand in your exams promptly when the proctors announce you must cease work.

Place your answer to this question in booklet #1

Question #1 (20 points)

True/False/Uncertain

Please evaluate each of the 5 statements as either true, false, or uncertain. Each statement is worth 4 points. Credit is determined by the quality of your explanation. No credit will be given for answers lacking an adequate explanation.

- a) Suppose that in the short run, a firm is maximizing profits using a variable amount of labor and a fixed amount of capital. If the price of capital falls, the firm will respond by increasing its use of labor.
- b) Suppose that, in a perfectly competitive market, in the short run, some firm's average cost exceeds its long run minimum average cost. Then in the long run, the firm will increase its output.
- c) Suppose Jane consumes only apples and oranges. If Jane's consumption of apples actually increases when the price of apples increases, then oranges must be a normal good to Jane.
- d) If labor and capital are always used in a fixed proportion during production, then the firm's technology must exhibit constant returns to scale.
- e) Suppose you consume only two goods, bagels and coffee, which are perfect complements. You would be strictly worse off with a per-unit tax on coffee than with an income tax that did not change the price of coffee, but collected the same revenue as the per-unit tax. (Hint: What are the substitution and income effects of the per-unit tax?)

Place your answer to this question in booklet #2

Question #2 (20 points)

Pat is taking an economics examination in which there are two questions. The first question is on Consumers and the other on Firms. Denote the number of points on each question by C and F respectively. Pat's utility function is given by

$$U(C, F) = CF + C + F$$

(4 points) a) Describe Pat's preferences about his scores on the examination. (Hint: More than just the total score matters to Pat.)

(4 points) b) Pat has 90 minutes to answer both questions. Because the Consumers question is harder, he will need 4 minutes of his precious time to earn each point on this question, but only 2 minutes to earn each point on the Firms question. A perfect score on each question is 100. What is Pat's utility maximizing allocation of time for each question? How many points does he earn on each question?

(4 points) c) Suppose that the TA has written an alternative (and much harder) problem for the Consumers question; it will take 8 minutes for each point. However, if Pat chooses to solve this harder alternative, the TA will give him 134 minutes (instead of 90) to allocate between the two questions. Which of the two Consumers problems would Pat choose to solve? Why? Do not solve for Pat's new utility maximizing scores. (Hint: Instead, graph Pat's budget constraint and optimal choice with the easy Consumer question, and Pat's budget constraint with the hard Consumer question.)

Explain your answer.

(4 points) d) If Pat decides to solve the harder alternative, will his score on the Consumers question increase, decrease or stay the same compared to part b)? **Explain your answer.**

(4 points) e) Suppose that instead of giving an alternative for the Consumers question, the TA gave Pat no choice. Pat has to solve the harder problem

with no extra time. Draw a diagram which illustrates “income” and substitution effects of this “price” change with C on the vertical axis and F on the horizontal axis. Label all of the intersections.

Place your answer to this question in booklet #3

Question #3 (25 points)

Ali lived in Florida and worked as a scuba diver at Disney World, a job which paid him \$2000 a month. One day, while strolling along a golf course and thinking about his financial situation, he passed by a pond. He saw many golf balls that went astray covering the bottom of the pond. Ali took some of the balls with him, cleaned them and tried to sell them to several golf supplies stores. To his surprise, they were all willing to buy the balls for 30 cents each.

Ali decided to make it into a business. He rented a small shop for \$500 a month, and, being a professional scuba diver, he started diving into the ponds on the golf course, collecting the balls, cleaning them and selling them for 30 cents each. (He had to quit his job at Disney World, though.)

Recalling his introductory microeconomics class in college, Ali was able to calculate that his short run average variable costs were

$$10^{-6} \cdot q + 0.1$$

where q is the number of balls he sells each month.

(5 points) a) Write down Ali's average total cost function, short-run total cost function and marginal cost function.

(5 points) b) Calculate Ali's supply of golf balls and draw on a graph.

(5 points) c) What is the minimal level of average total cost? How many balls does he sell at that point?

(10 points) d) Suppose the golf-course owner discovers Ali's business and decides to charge him a fee for using the pond. She lets Ali choose between three alternatives. Write down the quantity of balls sold and the profits for Ali for these three alternatives:

1. Unlimited use of the ponds for \$2500 a month.
2. A fee of 5 cents for every ball sold.
3. 20 % of the profits Ali makes.

(Based on a true story.)

Place your answer to this question in booklet #4

Question #4 (25 points)

The U.S. government has announced that, effective immediately, all candy bars must henceforth be fortified with Vitamin E. Up to now, candy bars have been sold in a competitive market in which each firm's long run marginal cost of production has been constant at \$0.40 per bar. Prior to the government's announcement, the U.S. market demand curve for candy bars was $P = 2 - 0.2Q$, where P is the price (in dollars per bar) and Q is the quantity (in billions of bars).

(5 points) a) Suppose that it will cost each firm \$0.10 per bar to include the required Vitamin E. Suppose, in addition, that consumers place no additional value on the presence of Vitamin E in candy bars (i.e., they are willing to pay no more for candy bars with Vitamin E than for those without). Graph the new market equilibrium, correctly labelling the values for the new P and Q . What happens to producers' and consumers' surplus? Show this on your graph.

(5 points) b) Suppose, as in part a), that it will cost each firm \$0.10 per bar to include the required Vitamin E. However, suppose that consumers are willing to pay an additional \$0.10 per bar for candy bars that contain Vitamin E. Again, show what will happen to the equilibrium price and quantity of U.S. candy bars, as well as producers' and consumers' surplus.

(10 points) c) Suppose instead that consumers are willing to pay an additional \$0.20 per bar for candy bars that contain Vitamin E. Suppose also that, in the short run, only 8 billion candy bars can be fortified with Vitamin E at a cost of \$0.10 per bar and that any additional bars could be fortified only at a cost of \$0.30 per bar. In the long run, however, all bars can be fortified at \$0.10 per bar. Describe the short run and long run equilibrium in this market (prices, quantities, and profits). Will there be any entry or exit of firms in the short run or the long run?

(5 points) d) Suppose that at the time of the announcement, firms have an unsold stock of one billion bars without Vitamin E. These can no longer be sold in the U.S., but can be sold in developing countries at a price of \$0.10 per bar. What effect will this have on your above analysis?