

ECON 001 Fall 2015

A. Duchene

Midterm 2

November 4, 2015

Time Limit: 60 Minutes

Name (Print): \_\_\_\_\_

Recitation Section: \_\_\_\_\_

Name of TA: \_\_\_\_\_

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**Read these instructions carefully:**

- This exam contains 11 pages (including this cover page) and 12 questions.
- This is a closed-book, closed-note exam, no calculator exam. You have 60 minutes to complete it.
- Enter all requested information on the top of **each** page. **Do not detach the pages.**
- Answer the multiple choice questions by circling the correct answer. Make sure that your answer is clearly circled or it will be marked incorrect.
- Write your answers to the other questions in the spaces provided below them. If you don't have enough space, continue on the back of the page and state clearly that you have done so.
- Do not remove any pages or add any pages. No additional paper is supplied
- Show your work when applicable. Use diagrams where appropriate and label all diagrams carefully.
- You must use a pen instead of a pencil to be eligible for remarking.
- This exam is given under the rules of Penn's Honor system.

Question	Maximum	Grade
MC (Q1-10)	36	
1st SA (Q11)	32	
2nd SA (Q12)	32	
Total	100	

## Multiple Choice Questions (best 9 out of 10: 36 points)

1. (4 points) Market supply is  $P = 10 + 0.5Q$  and market demand is  $P = 150 - 3Q$  in a perfectly competitive market. If a firm has fixed costs of 60, Variable Costs  $VC = 6q^2$  and Marginal Cost  $MC = 15q$ , which of the following will be true in the short run:
- A. The firm will be producing and making positive profits.
  - B. The firm will be producing, but making a loss.
  - C. The firm will shut down.
  - D. Not enough information to tell.

**Solution:** B

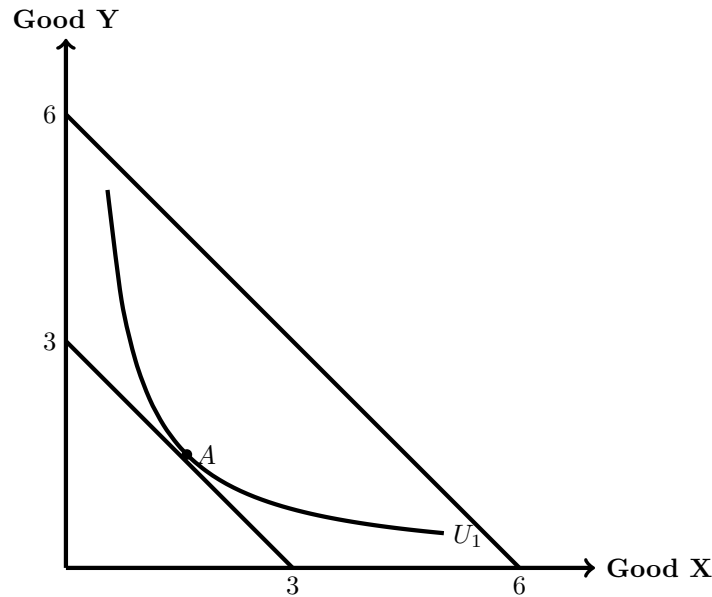
2. (4 points) Consider a monopoly facing zero marginal cost and charging the socially efficient price. If the firm were to raise its price by a small amount, which of the following would certainly occur?
- I. Producer Surplus would increase
  - II. Consumer Surplus would increase
  - III. Total Revenues would decrease
- A. I
  - B. I and II
  - C. I and III
  - D. II and III
  - E. I, II, and III

**Solution:** A

3. (4 points) You are told that, in a competitive market, a firm has fixed costs and is producing a quantity in the decreasing part of its ATC curve. Based solely on this information, which of the following statements must be correct?
- I. The firm should shut down
  - II. MC is upward sloping
  - III. AVC is increasing
  - IV. MC is lower than the ATC
- A. I, III and IV
  - B. Only IV
  - C. II and IV
  - D. I, II and III

**Solution:** B

4. (4 points) The graph below shows the consumption choices made by the consumer at point A (where they are on indifference curve  $U_1$ ) along an initial budget constraint between quantities of goods X and Y.



When the budget constraint switches in the way shown, we can conclude

- A. The person will consume twice as much of both goods.
- B. The person will consume more of each good.
- C. The person will consume more of one good but less of the other.
- D. The person will be twice as happy.
- E. The person will be happier.

**Solution:** E

5. (4 points) James has a fixed monthly budget which he spends entirely to consume pizza and beer. If the price of beer increases while the price of pizza is kept constant, James monthly budget line will:
- A. Move outwards in a parallel shift
  - B. Pivot to a larger intercept on the pizza axis while holding the other intercept fixed
  - C. Pivot so a smaller intercept on the beer axis while holding the other intercept fixed
  - D. Pivot both to a smaller intercept on the beer axis and to a larger intercept on the pizza axis.

**Solution:** C

6. (4 points) The local market currently has a monopoly that perfectly price discriminates. The monopolist faces an upward sloping marginal cost and a downward sloping demand. Now the government wants to regulate by requiring it to produce the output that would be produced if the market were perfectly competitive. Market demand is  $P = 10 - 2Q$  and the firm has a marginal cost function  $MC = 2q + 2$ . Assume that market demand, marginal cost and marginal revenue function are invariant to government intervention, then how would consumer surplus (CS), producer surplus (PS) and total surplus (TS) change under this regulation?

- A. CS increases, PS decreases and TS increases;
- B. CS increases, PS decreases and TS decreases;
- C. CS decreases, PS increases and TS increases;
- D. CS decreases, PS increases and TS decreases;
- E. None of the above

**Solution:** E

7. (4 points) Consider a firm that survives into the long run in a perfectly competitive market. If the market price has always been fixed at  $P^* = 10$  and the firm has fixed cost  $FC > 0$ , which of the following statements are consistent with this long-run observation? (Suppose this firm is in a constant cost industry.)
- I. It's possible that the minimum average variable cost of the firm is 8;
  - II. It's impossible that the minimum average variable cost of the firm is 10;
  - III. It's possible that the minimum average total cost of the firm is 8;
  - IV. It's impossible that the minimum average total cost of the firm is 12;
- A. I and III
  - B. II and IV
  - C. III and IV
  - D. I, III, and IV
  - E. I, II, III and IV

**Solution:** E

8. (4 points) Sally, owner of Sally's Scooters, has a monopoly on scooters and is deciding on how to set the price (she can only set one price). She knows that 5 people will buy her scooters at \$90, an additional 5 people will buy her scooters at \$50, an additional 5 people will buy her scooters at \$20, and an additional 5 people will buy her scooters at \$10. What price should Sally set, assuming her marginal cost of producing scooters is 0 and she wants to maximize profits?
- A. 100
  - B. 50
  - C. 25
  - D. 10

**Solution:** B

9. (4 points) Consider a consumer with a fixed income who buys two goods: housing and restaurant meals. Assume both are normal goods. After an decrease in the price of housing:
- A. Consumption of both goods will increase
  - B. Housing consumption increases, but meals decline
  - C. Housing consumption increases, but meals might decline or increase

- D. Meal consumption increases, but housing consumption declines
- E. Meal consumption increases, but housing consumption might increase or decline

**Solution:** C

10. (4 points) A firm in a perfectly competitive market faces the following cost structure:  $FC = 125$ ,  $AVC = 30 + 5q$ ,  $MC = 30 + 10q$ . What is the equilibrium price in the long run?
- A. 30
  - B. 50
  - C. 55
  - D. 80
  - E. 125
  - F. 140

**Solution:** D

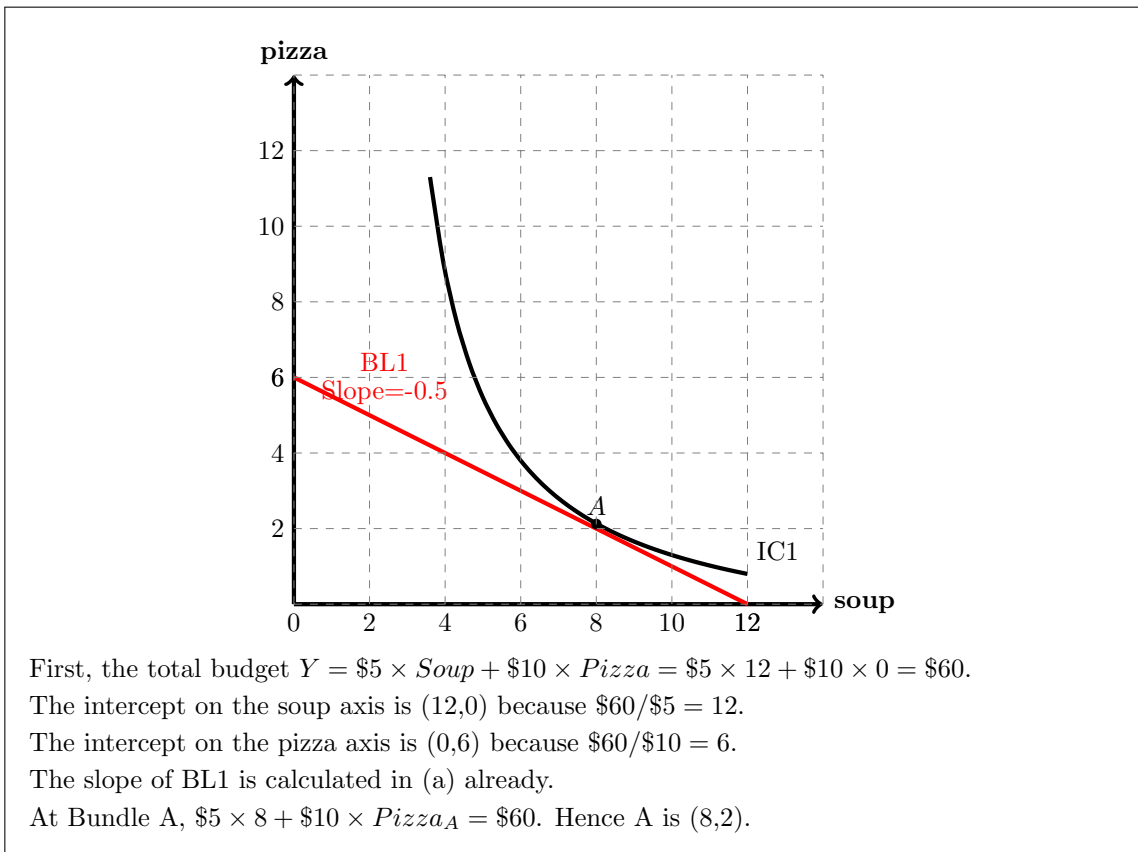
### Short Answer Questions (64 points)

11. (32 points) Kelly has  $Y$  dollars to spend on soups (\$5 each) and pizzas (\$10 each). If she only buys soups, she can get 12 of them. Kelly's preference over soups and sandwiches are given in the following indifference curve (see graph below in question (b)). And it is known that Bundle A is her optimal choice.
- (a) Without drawing a graph, find the marginal rate of substitution (MRS) at A.

**Solution:**  $MRS \text{ at A} = \text{slope of budget line} = -\frac{P_{soup}}{P_{pizza}} = -\frac{1}{2}$

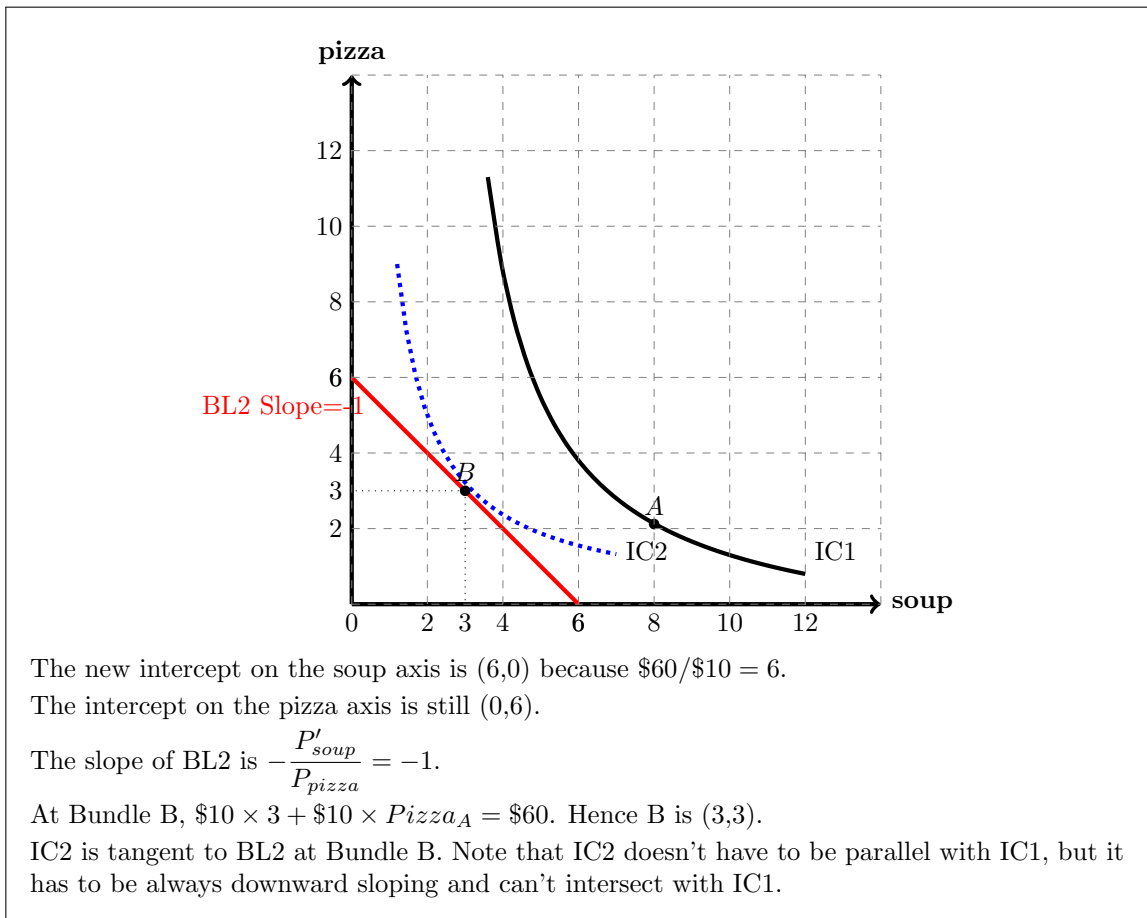
- (b) On the graph below, draw Kelly's budget line (BL1). Label the intercepts, the slope, and the coordinates of A. Explain how you get these numbers.

**Solution:**



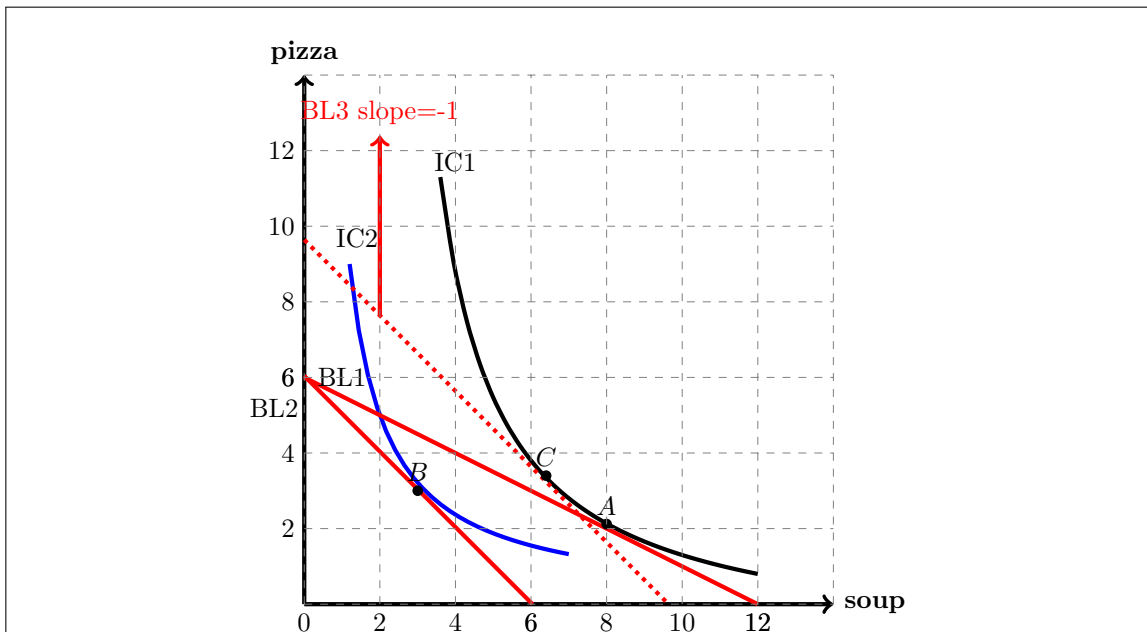
- (c) Now the price of soups increases to \$10, and Kelly reduces her consumption of soups from 8 to 3. Call this new consumption bundle B. Draw on the graph below her new budget line (BL2), Bundle B, and the indifference curve (IC2) that B sits on. Label the intercepts, the slope, and the coordinates of B. Explain how you get these numbers.

**Solution:**



- (d) Decompose the change in Kelly's consumption bundle due to this price increase into the substitution effect (SE) and the income effect (IE). You don't have to give specific numbers. Just indicate the change in bundle consumption due to the SE, as well as the change in bundle consumption due to the IE. Be sure to specify the direction of the change. Explain your answer on the graph below. Add lines and points if you need to, and label everything you draw clearly.

**Solution:**



**The change from A to C captures the SE.** Note that BL3 is parallel to BL2 and is tangent to IC1 at C. BL3 reflects a *hypothetical* increase/compensation to Kelly's budget under the new prices. Hence Bundle C shows how Kelly would change her consumption (switch *away* from soups) to stay at the same utility level as a result of the price change.

**The change from C to B captures the IE.** The inward shift from BL3 to BL2 reflects the decrease in Kelly's purchasing power after the price increase, which forces her to land on the lower IC2.

**From now on, suppose soups and pizzas become perfect complements for Kelly, and each pizza must be consumed together with two soups.**

(e) Without drawing a graph, find the MRS at (4,1).

**Solution:** MRS is 0 because Kelly needs 0 additional pizzas in exchange for reducing soup by 1 to stay at the same utility level.

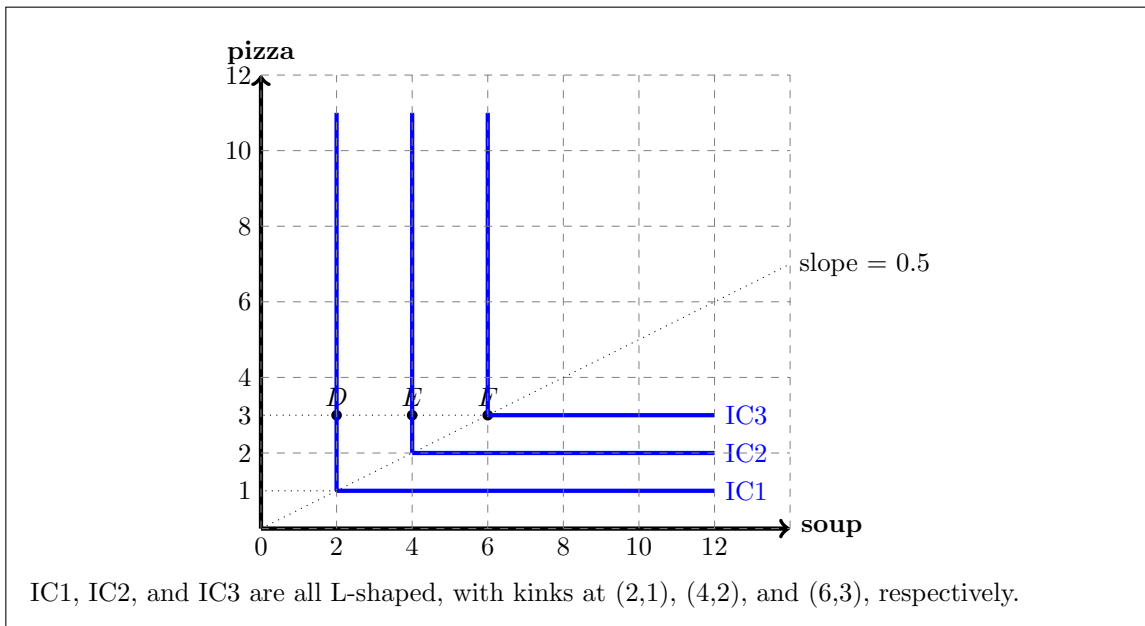
(f) Plot the following indifference curves on the graph below:

- IC1: goes though bundle D (2,3)
- IC2: goes though bundle E (4,3)
- IC3: goes though bundle F (6,3)

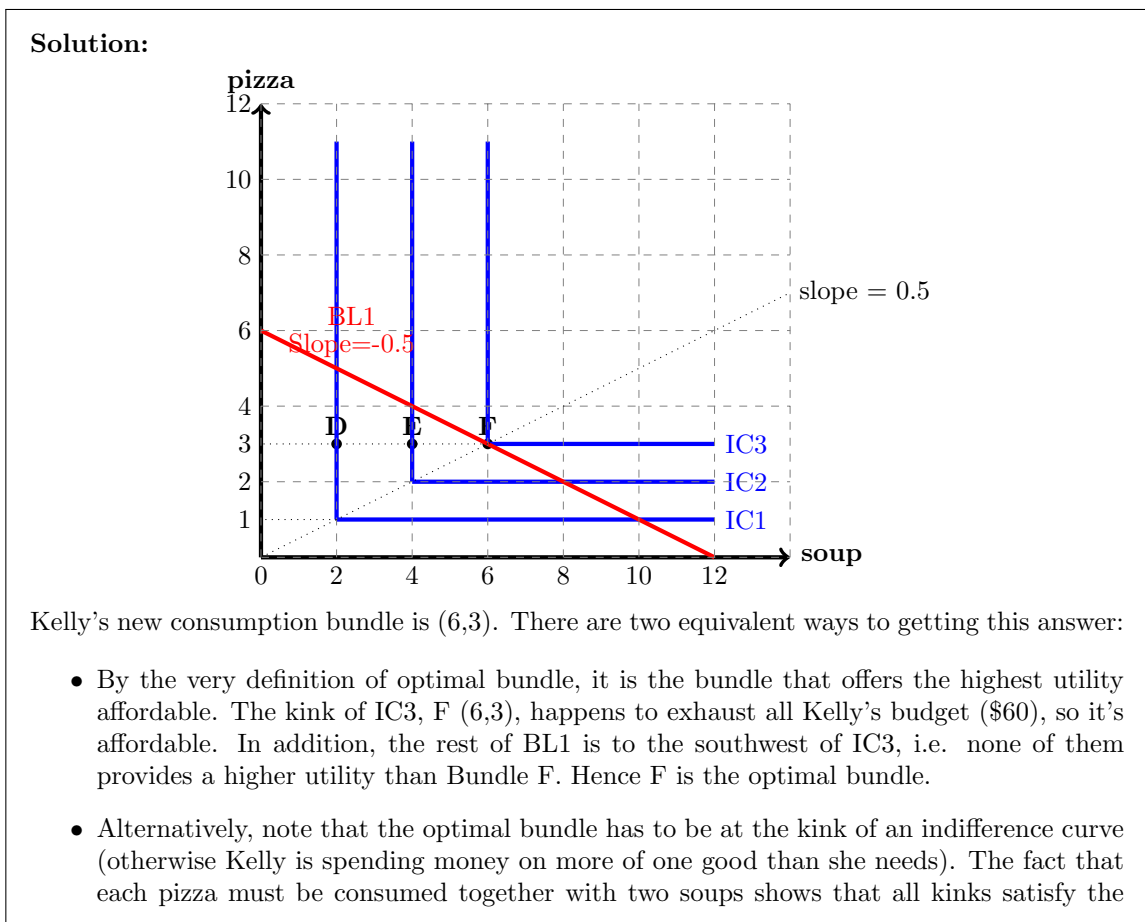
Label everything clearly.

**Solution:**





- (g) Suppose Kelly still has the same budget as before and the prices are still  $P_{soup} = \$5$  and  $P_{pizza} = \$10$ . Find Kelly's optimal consumption bundle on the graph above. How many soups and pizzas is she consuming? Explain your answer.



following relationship:

$$Pizza = 0.5Soup$$

Additionally, the optimal bundle has to be on the budget line

$$Pizza = 6 - 0.5Soup$$

Hence the optimal bundle has to be at the intersection of the above two lines, i.e. (6,3).

12. (32 points) The Art Museum of Philadelphia faces the following demand curve  $P = 200 - 0.1Q$ , where  $P$  is the price of a ticket and  $Q$  is the number of visitors in a year.

The demand curve implies a marginal revenue curve of  $MR = 200 - 0.2Q$ .

The museum has large fixed cost,  $FC = 50,000$ , but the marginal cost per visitor is zero.

- (a) If the Philadelphia Art Museum aims to maximize profits, how many visitors would it have? What would be the price of a ticket?

**Solution:** The museum maximizes profits, so it chooses the quantity  $Q$  such that  $MR = MC \equiv 200 - 0.2Q = 0 \equiv Q = 1,000$ . The corresponding price is  $P = 200 - 0.1 * 1,000 \equiv P = \$100$ .

- (b) The Philadelphia Art Museum is actually a not-for-profit organization. Suppose its goal is to maximize revenue. If that is indeed the case, how would your answer to part (a) change?

**Solution:** Since the marginal cost is zero, the answer would be the same as in (a)

- (c) The mayor of Philadelphia calls the director of the Art Museum: “Culture is a very important magnet for the tourism in our city. Moreover, my economic advisors told me we are not reaching the efficient number of visitors.” Suppose the director listens to the concerns of the mayor.

- i. What is the socially (i.e. allocatively) efficient number of visitors?

**Solution:** The socially efficient number of visitors is such that  $P = MC \equiv 200 - 0.1Q = 0 \equiv Q = 2,000$ .

- ii. What is the corresponding price?

**Solution:** The corresponding price is  $P = 200 - 0.1Q = 0$

- iii. What are the corresponding profits?

**Solution:** The corresponding profits are equal to  $-FC = -50,000$ .

- (d) (*This question has been updated from the addendum handed with the exam*) The director replies to the mayor saying that she would really like to have the efficient number of visitors but that needs a per ticket subsidy from the city. What is the per ticket subsidy that would make the profit maximizing museum choose the efficient outcome? *Hint: find the subsidy  $s$  such that the museum’s profit maximizing quantity is efficient when its marginal cost is  $MC' = MC - s$ .*

**Solution:** The subsidy needs to be such that the new marginal cost intersects the marginal revenue for the efficient quantity of 2,000. The new marginal cost is equal to  $0 - s = -s$  and the marginal revenue is equal to  $200 - 0.2 * 2000 = -200$  when the quantity is  $Q = 2000$ . Therefore the per unit subsidy must be equal to \$200.

- (e) The treasurer of the city council opposes the subsidy because the city is already burdened by debt. The treasurer suggests instead that the museum should charge a different price to different visitors. Assume the Museum can perfectly distinguish between each visitor's willingness to pay.

i. Can the Museum achieve the efficient outcome? Explain

**Solution:** Yes. If the museum uses first degree (perfect) price discrimination, it will sell the socially efficient quantity, charging a different price to each visitor.

ii. What would be the profits in this case?

**Solution:** The museum will capture the entire total surplus: its producer surplus will be equal to  $200 * 2000 * 0.5 = 200,000$ , so its profit will be equal to  $PS - FC = 150,000$

iii. What would be the maximum and minimum price of a ticket?

**Solution:** The maximum price would be \$200 and the minimum price would be 0.

- (f) Calculate the Consumer Surplus in part (d) and (e). Use the criteria of equity to evaluate your answers in parts (d) and (e).

**Solution:** In part (d) consumer surplus is equal to \$200,000 while in part (e) consumer surplus is 0. So even though total surplus is the same in both parts, it either all goes to the consumers (in part (d)) or to the producer (in part (e)). In other words, the size of the pie is the same but the slicing of the pie is different. It may be considered more equitable to give a bigger slice to consumers, in which case part (d) would be more equitable. But there are different possible answers to this question, all debatable.