

Economics 100A
Prof. Daniel McFadden
Fall 2001

MOCK FINAL EXAMINATION
December 4, 2001

Name: _____

SID #: _____

GSI: _____

Instructions:

Mark only on the exam.
Do not separate pages.
Calculators are permitted.

MULTIPLE CHOICE

For the following questions circle the ONE correct answer.

1. Judy divides her consumption between orange juice and bagels. Orange juice costs \$1.00 per glass and bagels cost \$3.00 each. Judy consumes positive amounts of both goods, and has chosen consumption quantities where her marginal utility of orange juice is 10 utils per glass, her marginal utility of bagels is 25 utils per bagel, and she spends all her income.

- a. Judy cannot increase utility further, given her income.
- b. Judy can increase utility by consuming more orange juice and fewer bagels.
- c. Judy can increase utility by consuming less orange juice and more bagels.
- d. Judy should consume only orange juice.

ANSWER b

2. In a used car market, 25 percent of the cars are lemons and the rest are gems. Buyers do not know if a car is a lemon or a gem, but sellers know. Buyers are willing to pay 120 percent of seller's value for a car, and seller's values are \$4,000 for a gem and \$2,000 for a lemon. In market equilibrium,

- a. price is between 4,000 and 4,800, and deadweight loss is zero.
- b. price is between 4,000 and 4,800, and deadweight loss is positive.
- c. price is between 2,000 and 2,400, and deadweight loss is zero.
- d. price is between 2,000 and 2,400, and deadweight loss is positive.

ANSWER a

3. A firm has both domestic and overseas demand. If the price elasticity of overseas demand is less than the price elasticity of domestic demand, the firm will

- a. sell more product overseas.
- b. sell more product domestically.
- c. charge a higher price overseas.
- d. charge a higher price domestically.

ANSWER c

4. Farmer Jones sells carrots and buys beets. His income elasticity of demand for both carrots and beets is positive. An increase in the price of carrots causes him to

- a. increase carrot consumption due to the substitution effect, and increase carrot consumption due to the income effect.
- b. decrease carrot consumption due to the substitution effect, and decrease carrot consumption due to the income effect.
- c. increase carrot consumption due to the substitution effect, and decrease carrot consumption due to the income effect.
- d. decrease carrot consumption due to the substitution effect, and increase carrot consumption due to the income effect.

ANSWER d

5. If the price of butter rises, then in the market for a substitute such as margarine,

- a. supply shifts to the left.
- b. supply shifts to the right.
- c. demand shifts to the left.
- d. demand shifts to the right.

ANSWER d

6. If goods in year 1 and year 2 are both normal goods, then an increase in income in year 1

- a. increases both savings and consumption in year 1.
- b. increases savings and decreases consumption in year 1.
- c. decreases savings and increases consumption in year 1.
- d. decreases both savings and consumption in year 1.

ANSWER a

7. If the interest rate is 5%, find the present value of \$10.00 received in two years.

- a. \$9.07
- b. \$9.52
- c. \$10.50
- d. \$11.03

ANSWER a

8. Oskar is an expected utility maximizer whose utility of wealth W (measured in thousands of dollars) is $U(W) = 200W - W^2$. Oskar has initial wealth $W = 100$, but faces a 50 percent risk of losing 10 and a 10 percent risk of losing 100, due to a flood. Which of the following alternatives will he choose?

- a. Buy no flood insurance.
- b. Buy complete insurance that costs 20.
- c. Buy "10-deductible" insurance that costs 10 and repays any loss over 10.

ANSWER c

9. If a commodity for which a consumer is a net buyer is an inferior good, then

- a. increasing price must increase demand.
- b. demand rises less than proportionally with income.
- c. the income effect reinforces the substitution effect.
- d. falling income increases demand.

ANSWER d

10. A firm facing the curve to the right giving the value in dollars of the total product of a laborer will hire this worker for the hours necessary to achieve point



- a. A
- b. B
- c. C

ANSWER a

11. Robert has utility function $U(x_A, x_B) = x_A^2 x_B^2$, where x_A is the quantity of apples and x_B the quantity of banana he consume. If the price of apples is p_A , the price of bananas is p_B , and his income is m , then Robert's demand for apples is

- (a) $m/(2p_A)$
- (b) $0.25p_A m$
- (c) $m/(p_A + p_B)$
- (d) $m(p_A/p_B)$

ANSWER: (a)

12. The Engel curve of good x:

- (a) traces all the optimal values of x as the price of x increases, holding income constant.
- (b) is upward sloping when x is a normal good
- (c) is the same as the inverse demand curve of x
- (d) all of the above

ANSWER: (b)

13 Jon considers x and y to be perfect substitutes. Specifically, he has a utility function of the form $U(x,y) = x + y$. Suppose that Jon's income is 720 and that originally the cost of x and y is 10 and 9, respectively. If the price of x drops to 8, then:

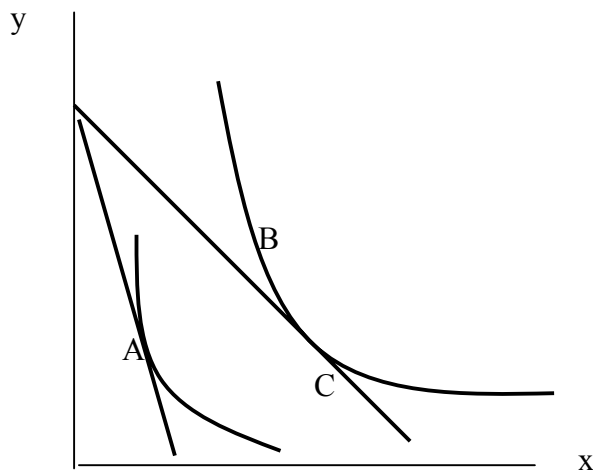
- (a) the income effect increases the quantity of y by 90.
- (b) the substitution effect increases the quantity of y by 80
- (c) the substitution effect increases the quantity of x by 90
- (d) the income effect increases the quantity of x by 80

ANSWER: (c)

14. Suppose that the income and substitution effects of an increase in the price of x work in different directions. That is, suppose one effect works toward increasing the quantities demanded of x , while the other works toward decreasing the quantities demanded of x . Then we know that:

- (a) good x is a normal good
- (b) good x cannot be a Giffen good
- (c) the income effect works toward decreasing the quantities demanded of x .
- (d) none of the above

ANSWER: (d)



15. Consider the graph above. Point A is an initial optimal bundle. Point C is the optimal bundle resulting after a decrease in the price of good x , while holding the price of y and income constant. Points B and C are bundles on the same indifference curve. The dotted line is just a parallel translation of the initial budget line.

- (a) The move from point ___ to point ___ corresponds to the substitution effect.
- (b) The move from point ___ to point ___ corresponds to the income effect.
- (c) The move from point ___ to point ___ corresponds to the total price effect.
- (d) Is x a normal or inferior good?
- (e) If point A were to the right of point B, would your answer to part (d) be different? How?

ANSWER:

- (a) B, C
- (b) A, B
- (c) A, C
- (d) Normal
- (e) Yes. With A to the right of B, answer to part (d) would be “inferior”.

16. Let the production function be $F(L)=6L^{2/3}$. Suppose that the cost per unit of labor is 8 and the price of output is 8, how many units of labor will the firm hire?
- a. 128
 - b. 64
 - c. 32
 - d. 192
 - e. None of the options are correct

ANSWER: (b)

17. Let the production be $f(x_1, x_2) = x_1^{1/2} x_2^{1/2}$. If the price of factor 1 is 8 and the price of factor 2 is 16, in what proportions should the firm use factors 1 and 2 if it wants to maximize profits.
- a. $x_1 = x_2$.
 - b. $x_1 = 0.50x_2$.
 - c. $x_1 = 2x_2$.
 - d. We can't tell without knowing the price of output.

ANSWER: (c)

18. Suppose that Betty has a production function $3x_1 + x_2$. If the factor prices are 9 for factor 1 and 4 for factor 2, how much will it cost her to produce 50 units of output?
- a. 1,550
 - b. 150
 - c. 200
 - d. 875
 - e. 175

ANSWER: (b)

19. If a firm is a price taker, then its marginal revenue will:

- a) Be less than the demand curve.
- b) Be downward sloping.
- c) Equal market price
- d) Equal zero.

ANSWER: (c)

20. If leisure is a normal good and wage increases,

- a. Labor supply must increase if substitution effect for leisure outweighs the income effect.
- b. Labor supply may decrease if substitution effect for leisure outweighs the income effect.
- c. Labor supply may be upward sloping.
- d. Labor supply will shift to the right.

ANSWER: (A)

21. If both present and future consumption are normal goods, a rise in the interest rate will:

- a. Both present and future consumption will rise if the person in consideration is a borrower initially.
- b. Both present and future consumption will rise if the person in consideration is a lender initially.
- c. Present consumption will rise and future consumption will fall if the person in consideration is a lender initially.
- d. Present consumption will fall and future consumption will rise if the person in consideration is a lender initially.

ANSWER: (B)

22. if a person has a concave utility function,

- a. He/she is indifferent between taking a lottery (50% chance of winning \$5 and losing \$5) or not.
- b. The certainty equivalent of a lottery is larger than the expected value of the bet.
- c. He/she may take the lottery if the lottery is fair.
- d. His/her expected utility from a lottery is less than the utility of the expected value of the lottery.

ANSWER: (D)

23. The following 3 questions are about a perfect competitive market where each firm has a cost function of $C(y) = 10 + y^2$. There are 8 firms in this industry.

(1) The firm supply for the firm is :

- a) $p = 10 + 2y$
- b) $p = 2y$
- c) $p = 10/y + y$

- d) $p = y$
- e) cannot be determined without the knowledge of the marginal revenue.

ANSWER: (B)

(2) The industry supply is equal to:

- a) $p = 4Y$, where Y is the industry output
- b) $p = 16Y$
- c) $p = Y/4$
- d) $p = 8Y$
- e) cannot be determined without the knowledge of the demand curve.

ANSWER: (C)

Suppose now that the demand for the product in this industry is $p = 100 - Y$, where Y is the industry output.

(3) the equilibrium price and quantity in this industry is equal to, respectively:

- a) \$20; 80
- b) \$80; 20
- c) \$20; 20
- d) \$80; 80
- e) \$45; 55

ANSWER: (A)

24. A monopoly faces the following demand curve $P = 100 - y$ and $MC = 20$. The profit-maximizing price and quantity are, respectively:

- a) \$40; 60
- b) \$60; 40
- c) \$80; 20
- d) \$45; 55
- e) \$20; 80

ANSWER: (B)

25. If Lisa loves to work on Econ 100A problem sets but hates writing term papers in her literature class, which of the following best represents her utility function for economics and literature assignments (E and L)?

- (a) $U = E + L$
- (b) $U = \min\{E, L\}$
- (c) $U = E^2 L^{1/2}$
- (d) $U = E/L$

Answer: D

26. When a consumer considers hot dogs to be an inferior good (but not Giffen),
- (a) The demand curve for hot dogs will be upward sloping.
 - (b) The income and substitution effects of a price change will move in opposite directions.
 - (c) The Engel curve will be upward sloping
 - (d) All of the above

Answer: B

27. For an incumbent, investing in plant and equipment that reduces its marginal cost while raising its total cost makes sense if
- (a) The potential entrant cannot enter the market profitably after the incumbent makes the investment and produces the entry-deterring level of output.
 - (b) The incumbent's profit from producing the entry-deterring output after making the investment is positive.
 - (c) The incumbent's profit from producing the entry-deterring level of output after making the investment exceeds the profit the firm would earn if it didn't make the investment and entry occurred.
 - (d) The potential entrant would not enter the market anyway.

Answer: C

28. If an allocation is Pareto optimal and if indifference curves between the two goods have no kinks, then it must be that:
- (a) Two consumers who consume both goods must have the same MRS between them but consumers may consume the goods in different ratios.
 - (b) Two consumers with the same income who consume both goods must have the same MRS, but if their incomes differ their MRS's may differ.
 - (c) For any two consumers who consume both goods, neither will prefer the other consumer's bundle to his own.
 - (d) All consumers receive the bundle that they prefer to any other bundle the economy could produce for them.

Answer: A

29. An economy has two people Charlie and Doris. There are two goods, apples and bananas. Charlie has an initial endowment of 3 apples and 8 bananas. Doris has an initial endowment of 6 apples and 4 bananas. Charlie's utility function is $U(A_C, B_C) = A_C B_C$ where A_C is his apple consumption and B_C is his banana consumption. Doris's utility function is $U(A_D, B_D) = A_D B_D$ where A_D and B_D are her apple and banana consumptions. At every Pareto optimal allocation,
- (a) Charlie consumes the same number of apples as Doris.
 - (b) Doris consumes equal numbers of apples and bananas.
 - (c) Charlie consumes more bananas per apple than Doris does.
 - (d) Charlie consumes 9 apples for every 12 bananas that he consumes.

Answer: D

30. The inverse demand function for mangos is defined by the equation, $p=91-5q$, where q is the number of crates that are sold. The inverse supply function is defined by $p=3+6q$. In the past there was no tax on mangos but now a tax of \$44 per crate has been imposed. What are the quantities produced before and after the tax was imposed?

- A. 5 crates before and 5 crates after
- B. 16 crates before and 9 crates after
- C. 14 crates before and 7 crates after
- D. 8 crates before and 4 crates after
- E. None of the above.

Ans: D

31. The inverse demand function for cigars is defined by $p=240-2q$ and the inverse supply function is defined by $p=3+q$. Cigars are taxed at \$4 per box. Which of the following is true?

- A. The after tax price paid by consumers rises by more than \$2 and the after tax price received by suppliers falls by less than \$2.
- B. The after tax price paid by consumers goes up by less than \$2 and the after tax price received by suppliers rises.
- C. Consumers and suppliers share the cost of the tax equally.
- D. The after tax price paid by consumers rises by \$4 and the after tax price received by suppliers stays constant.
- E. The after tax price paid by consumers rises by less than \$2 and the after tax price received by suppliers stays constant.

Ans. A

32. The demand function is described by the equation $q(p)=210-p/4$. The inverse demand function is described by:

- A. $q(p)=210-4p$.
- B. $p(q)=840-4q$.
- C. $q(p)=1/(210-p/4)$.
- D. $p(q)=1/210-q/4$.
- E. $p(q)=210-q/4$.

Ans. B

33. If the demand function is $q=m-2(\ln p)$ over some range of values of p , then at all such values of p the absolute value of the price elasticity of demand:

- A. increases as p increases.
- B. decreases as p increases.
- C. is constant as p changes.
- D. increases with p at small values and decreases with p at large values.

E. decreases with p at large values and increases with p at small values.

Ans: A

34. In the village of Frankfurter, the demand function for sausages per person is $D(p)=20-1.5p$, where p is the price of a single sausage. The present population of Frankfurter is 100 persons. Suppose that 10 more people move into town, each of whom has the same demand function as the old residents. At a price of \$2 the price elasticity of demand for sausages in Frankfurter is:

- A. increased by 10 percent.
- B. decreased by 10 percent.
- C. unchanged.
- D. increased by 15 percent.
- E. none of the above.

Ans. C

35 Consider a 2-good economy of apples and oranges, and a consumer, Jonas, has smooth, convex preferences. Suppose Jonas is maximizing utility and consuming positive amounts of both apples and oranges. If the price of apples increases and Jonas demands fewer apples, then

- (a) apples must be a Giffen good.
- (b) apples must be an inferior good.
- (c) apples must be a normal good.
- (d) apples can be either an inferior or a normal good.

ANSWER: (D)

36 Suppose the firm is producing at a level of output, $y=100$. At that level of output $SRAC > LRAC$ and $SRMC < LRMC$. In the long-run the firm wants to produce 100 units at the lowest possible cost. Therefore, the firm should

- (a) increase capital (K)
- (b) decrease capital (K)
- (c) increase labor (L)
- (d) decrease labor (L)

ANSWER: (B)

37 Suppose a profit maximizing monopolist has total costs $C(Y) = 10Y$. The monopolist is charging a profit maximizing price or $p=15$. If market demand has a constant price elasticity, then the price elasticity of demand must be

- (a) $|\epsilon| = 3$
- (b) $|\epsilon| = 3/2$
- (c) $|\epsilon| = 1$
- (d) $|\epsilon| = 2/3$

ANSWER: (A)

38 Consider an economy with only two goods, good X and good Y. The price of good X is p and the price of good Y is p . If everyone in the economy is maximizing utility at an interior solution (i.e. consuming positive amounts of good X and good Y) and faces the same prices for good X and good Y, then

- (a) everyone must have the same MRS.
- (b) everyone must have the same preferences.
- (c) everyone must have the same income.
- (d) everyone must have the same utility function.

ANSWER: (A)

39-40. A manufacturing firm uses only capital (K) and labor (L) to produce its product, using a production function of $Q = 10KL$. It pays its workers $w = \$15$ per hour and has a rental cost of capital of $r = \$5$ per hour.

39. This firm's production function exhibits:

- a) decreasing returns to scale.
- b) increasing returns to scale.
- c) constant returns to scale.
- d) returns to scale that depend on the production level.

Answer: [b].

40. If the firm wants to produce 480 units of output. What is the optimal bundle of inputs (L^*, K^*) it should use to minimize its cost of production? (Note: $MPL = 10K$ and $MPK = 10L$.)

- a) (3, 16).
- b) (6, 8).
- c) (4, 12).
- d) (12, 4).

Answer: [c].

41. Suppose the total cost to produce quantity q is $TC(q) = 10 + q^2/10$, and hence, marginal cost is $MC(q) = q/5$. If this firm is a price-taker and the market price is $p = 10$ and its fixed cost is sunk, then the firm's profits will be:

- a) 240
- b) 260
- c) 250
- d) -10 because the firm will shut down.
- e) 0 because the firm will shut down.

Answer: [a].

42. If a firm is a price taker, then its marginal revenue will:

- a) Be less than the demand curve.
- b) Be downward sloping.
- c) Equal market price.
- d) Equal zero.

Answer: [c].

SHORT ANSWER

Answer the questions in the space provided. Show all work.

1/2/3. American and United airlines are rivals on the route from San Francisco to Chicago. The market game described below in strategic form gives the profits of each depending on the actions of both, with American's profit listed first:

| UNITED ----- AMERICAN | Full Fare | Match Announced Discount | Always Discount |
|-----------------------------|-----------|--------------------------------|--------------------|
| Full Fare | 12,12 | 12,12 | 5,15 |
| Announced Discount | 15,5 | 11,9 | 10,10 |
| Unannounced Discount | 14,8 | 14,8 | 9,11 |

1. If American has a strongly dominated strategy, write it in; otherwise write "none".

ANSWER _none_____

2. IF United has a dominant strategy, write it in; otherwise write "none".

ANSWER _always discount

3. If there is a Nash equilibrium, write in the action for American, followed by the action for United, that constitute a Nash equilibrium; otherwise write "none".

ANSWER _announced discount, always discount

4/5/6/7. Between Oakland and Lake Tahoe, Morris Air has a monopoly in two markets, one for students who are willing to fly on a standby basis, and one for business people who are not. The marginal cost of a seat on a plane that is not filled to capacity is zero. The demand function of all students combined is $Q_S = 500 - 25P_S$ and the demand function of all non-students combined is $Q_N = 4000 - 10P_N$. If the airline can engage in third-degree price discrimination and its planes are not filled to capacity, find

4. The price to students.

ANSWER _10_

5. The price to non-students.

ANSWER _200

6. The deadweight loss in the market.

ANSWER _201250

7. Suppose price discrimination between students and non-students is illegal. What is the deadweight loss in the market?

ANSWER _205000

8. Suppose that the out-of-pocket cost of a one-year night course in Japanese language is \$1800. If you take the course, you could thereafter increase your annual salary by \$220 per year because of your additional language skills. Assume that the annual rate of interest is 10 percent, and that you will live forever. What is the present value of this investment?

ANSWER _200_

9/10/11. In the figure to the right, indifference curves of a professor are given by solid curves. Her preferences increase when compensation is higher, and beyond some point decrease when teaching quality increases, due to the increased effort required. The indifference curves of students are given by dotted curves. Student preferences increase when teaching quality improves, and decrease when tuition is increased to pay the professor's salary. The professor has the opportunity to pursue alternative employment (as a movie star); this provides compensation which would put the professor at the utility level corresponding to indifference curve M..



9. Pick the letter corresponding to the lowest salary the professor could be paid and remain in teaching.

ANSWER _f_

10. If the professor is offered the compensation schedule, represented by the straight line in the diagram, that pays \$10,000 for each point of teaching quality, pick the letter where the professor will choose to locate.

ANSWER _b_

11. Pick the letter where the professor will locate if the students can design the compensation schedule.,

ANSWER _c_

12. The diagram to the right shows the utility of income, measured in such a way that the utility of a lottery is given by the sum of utilities of the outcomes of the lottery, weighted by the probabilities of these outcomes. The consumer holds a lottery that will pay 10 or 30, each with probability one-half.



How much would this consumer be willing to pay for an insurance policy that guarantees 20, no matter what the outcome of the lottery. (Give the total payment the consumer would make, including both the actuarial expected value of the insurance and any extra premium paid to avoid risk.)

ANSWER ____ 4

13. Each firm in a competitive market has an identical cost function $C(q) = 16 + q^2$. The market demand function is $q = 24 - p$.

A) Find the individual firm's supply function and the market supply function (assuming that there are n many firms).

B) What is the condition for this market to be in a long run equilibrium?

C) Assuming that the market is in long run equilibrium, how many firms are in this market? (Hint, first find the equilibrium price and quantity as functions of n . Then, solve for n).

D) Find the equilibrium price and quantity in this market.

Answer

A) The $MC = MR$ condition gives us an individual firm's supply: $p = 2q$, or $q = p/2$. Market supply is $Q^s = nq = np/2$.

B) For the market to be in long run equilibrium (assuming free entry and exit), the market quantity supplied must equal the market quantity demanded and each firm must be earning zero profit.

C) First, use quantity supplied = quantity demanded to get:

$$\begin{aligned} Q^s &= Q^d \\ np/2 &= 24 - p \\ p &= 48/(n + 2) \end{aligned}$$

$$q = p/2 = 24/(n + 2)$$

The zero profit condition says that total revenue = total cost, so:

$$48/(n + 2) \times 24/(n + 2) = 16 + [24/(n + 2)]^2$$

$$[24/(n + 2)]^2 = 16$$

$$n = 4:$$

D) Equilibrium price is

$$P^* = 48/(4+2) = 8.$$

Equilibrium quantity is

$$Q^* = 24 - p^* = 16:$$

14. T/F. If the inflation rate is zero, the present value is the same as the future value.

Answer: False. Since present value depends on the real interest rate, and real interest rate measures the real return of assets or your impatience, even inflation rate is zero, the present value is different to the future value.

15. Suppose that a competitive firm is in the short-run equilibrium, maximizing profits for a given level of capital (the fixed input), and it has $SRMC < LRMC$ and $SRAC > LRAC$. In the long-run, what will happen to the level of capital and the level of output? (Assume that the number of firms in the industry does not change!)

ANSWER: In the long run, the firm will adjust the output level so $LRMC = P$. That implies, in this case, that K will be reduced as well as the output level. Check drawing the typical U-shaped cost curves.

16. Suppose two firms, A and B, compete as duopolists. Each firm has a marginal cost of \$5 and a fixed cost of zero. Market demand for the duopolists' homogeneous product is given by: $Q_D(P) = 100 - 2P$.

- Suppose that the duopolists behave according to Cournot's model. Find Firm A's reaction function given the output of Firm B, and Firm B's reaction function given the output of Firm A.
- Compute the Cournot equilibrium quantities for firms A and B.
- Now suppose that the two firms work together and form a successful cartel. Find the equilibrium price and quantity in the market.

Answers:

16a. First, write the demand curve as a function of quantity. $P = 50 - Q/2$

Now let's look at firm A's residual demand: $P = 50 - q_a/2 - q_b/2$

$$MR_a = MC_a \rightarrow 50 - q_a - q_b/2 = 5 \rightarrow \boxed{q_a = 45 - q_b/2}$$

And since both firms are identical (same MC), $\boxed{q_b = 45 - q_a/2}$

16b. Solve for the intersection of the two reaction functions: $q_a = 45 - (1/2)(45 - q_a/2) = 45 - (45/2) + (1/4)q_a$

$$(3/4)q_a = 22.5$$

$$\boxed{q_a = 30}$$

$$\boxed{q_b = 30}$$

16c. Solve for the monopoly P and Q (both have the same costs, so the cartel has a constant MC of 5).

$$MR=MC \rightarrow 50-Q=5 \rightarrow \boxed{Q=45, P=27.5}$$

17. Suppose that you were in charge of setting a price for some product that you were producing and that you had a good estimate of the demand curve for that product. Let us suppose that your goal is to set a price that maximizes profits. Then would you set the price where the elasticity of demand is less than 1? Explain.

Ans. No. If you raise your price, then your revenues would increase, and your production costs must decrease, so your overall profit must increase. Therefore, operating at an inelastic part of the demand curve cannot yield maximal profits.

18. Consider a market with two firms, firm A and firm B . Market demand is $P(Q) = 100 - Q$. Firm A has a cost function $C_A(q_A) = 10q_A$ and firm B has a cost function $C_B(q_B) = 15q_B$. Find the Cournot equilibrium levels of output.

Answer:

NOTE: $Q = q_A + q_B$

- Setup the profit maximization problem for each firm.
- Find the reaction (or best response) function for firm A and firm B by taking the derivative of the profit function and setting it equal to zero.
- Solve the two equations in 2 unknowns (q_A, q_B).

Firm A:

$$\begin{aligned} & \max P(Q) \cdot q_A - C_A(q_A) \\ & \max [100 - (q_A + q_B)] \cdot q_A - 10q_A \\ & \text{FOC: } 100 - 2q_A - q_B - 10 = 0 \end{aligned}$$

$$\boxed{BR_A(q_B): q_A = \frac{1}{2} * [100 - q_B - 10]}$$

Firm B:

$$\begin{aligned} & \max P(Q) \cdot q_B - C_B(q_B) \\ & \max [100 - (q_A + q_B)] \cdot q_B - 15q_B \\ & \text{FOC: } 100 - 2q_B - q_A - 15 = 0 \end{aligned}$$

$$\boxed{BR_B(q_A): q_B = \frac{1}{2} * [100 - q_A - 15]}$$

Substitute the equation for q_A from $BR_A(q_B)$ into the $BR_B(q_A)$ function and solve for $q_B = \mathbf{80/3}$. Plug this into $BR_A(q_B)$ to get $q_A = \mathbf{95/3}$.

19. Consider a standard, two-good budget constraint: $p_1x_1 + p_2x_2 = m$. Both goods are normal goods. Write the NEW budget constraint under the following scenarios. What do you expect will happen (i.e. increase, decrease, or ambiguous) to the consumption of EACH good under EACH scenario?

- a) A lump sum tax (T) is imposed.
- b) A quantity tax (t) is imposed on good 1.
- c) An ad valorem subsidy (s) is imposed on good 2.

a. Answer: $p_1x_1 + p_2x_2 = m - T$

A lump sum tax shifts the budget line towards the origin, which is a decrease in income. Since both goods are normal, you would expect consumption of both good 1 and good 2 to DECREASE.

b. $(p_1 + t)x_1 + p_2x_2 = m$

Under a quantity tax (or specific tax) on good 1, consumption of good 1 should DECREASE. The tax raises the price of good 1 relative to good 2. As a result, the substitution effect implies a decrease in consumption of good 1 and an increase in consumption of good 1. The increase in price reduces purchasing power. Therefore, the income effect for good 1 reinforces the substitution effect resulting in an unambiguous DECREASE in consumption of good 1. However, the income effect is also reducing consumption of good 2, but the substitution effect is increasing consumption of good 2. Therefore, the net effect on good 2 is AMBIGUOUS.

c. $p_1x_1 + (1 - s)p_2x_2 = m$

The subsidy lowers the price of good 2 relative to good 1. As a result, the substitution effect serves to increase consumption of good 2 and decrease consumption of good 1. The income effect is positive, in this case, since the consumer can purchase more of both goods following the price decrease. Therefore, the income effect encourages more consumption of both goods. Thus, the subsidy on good 2 unambiguously INCREASES consumption of good 2. The effect of the subsidy on consumption of good 1 is AMBIGUOUS since the substitution effect decreases consumption and the income effect increases consumption.

20 constant long-run marginal cost of \$10. In other words, $MC = AC$ at every scale of production. And note that there are no fixed costs in the long-run. Suppose the demand curve at any price is given by $Q = 1000 - P$.

- a) What are the price and quantity consumed in the long-run equilibrium?

Answer: *Supply in this case is perfectly elastic at a price of 10. Any quantity will be supplied at that price, so quantity demanded will be $Q = 1000 - 10 = 990$.*

- b) Suppose one firm enters that is different from the existing firms. The new firm has a constant marginal cost of \$9 and no fixed costs but can only produce 10 units (or fewer). What are the price and quantity consumed in long-run competitive equilibrium? Are these the same as in (a)?

Answer: *Since the new firm cannot produce over 10 units, the industry supply curve is unaffected beyond 10 units. Therefore, supply and demand intersect at same p and q as in (a).*

c) Identify the marginal cost of the last unit sold in (b). Is it \$10 or \$9? That is, if demand fell by 1 unit, would the new entrant or the other firms reduce output?

Answer: \$10. *If demand expands or contracts, the incumbent firms vary their output accordingly.*