

Last Name: \_\_\_\_\_

First Name: \_\_\_\_\_

Student Number: \_\_\_\_\_

## Economics 203: Intermediate Microeconomics I

### Sample Final Exam 1

Instructor: Dr. Donna Feir

#### Instructions:

- Make sure you write your name and student number at the top of this page.
- You have 3 hours to complete this exam. In order to minimize distractions to others, *you are not permitted to leave in the last 10 minutes of the exam.*
- You should answer all questions.
- Write your answers in the space provided. Use the backside of your exam for scrap paper if you wish, but only information written in the space provided will be considered for grading. You may also tear off the last page of the exam and use it for scrap paper.
- Use your time wisely. If you get stuck on a question move onto the next question and return if time permits.
- There are three sections to the exam:

**Section A** is worth 100 points in total and consists of 20 multiple choice questions. It is possible to get part markets if you clearly demonstrate some correct knowledge of the material.

**Section B** is worth 20 points in total and consists of 4 short answer questions

**Section C** is worth 80 points in total and consists of 4 long problems of varying length.

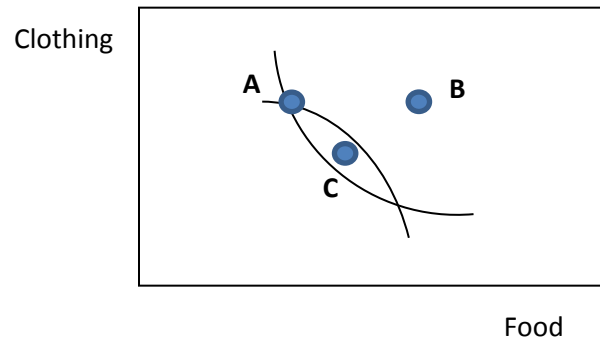
### Section A: Multiple Choice - 100 points total

1. Along a given indifference curve
  - a. Both the combination of goods and the consumer's income remain constant
  - b. The combination of goods remains constant
  - c. The combination of goods remains constant but the level of utility varies
  - d. The combination of goods varies but the level of utility remains constant**
  
2. Ordinal utility theory assumes that consumers can
  - a. Rank baskets of goods as to their preference**
  - b. Determine the number of utils that can be derived from consuming all goods
  - c. Determine the MRS between goods
  - d. Avoid the law of diminishing marginal utility
  - e. All of the above
  
3. In spending all his or her income, the consumer chooses the market basket that maximizes his or her utility. Which of the following statements will be correct?
  - i. The marginal utility is the same for each commodity.
  - ii. The marginal utility per dollar spent is the same for each commodity.
  - iii. The marginal utility of each commodity is proportional to its price.
  - a. i only
  - b. ii only**
  - c. i and ii only
  - d. ii and iii only
  - e. i, ii, and iii
  
4. If Fred's MRS of salad for pizza equals to -5 (where salad is on the vertical axis), then which of the following is true?
  - a. He would give up 5 pizzas to get the next salad
  - b. He would give up 5 salads to get the next pizza**
  - c. He will eat 5 times as much pizza as salad
  - d. He will eat 5 times as much salad as pizza
  - e. He must trade 5 times as much
  
5. A normal good can be defined as one which consumers purchase more of as
  - a. prices fall
  - b. prices rise
  - c. incomes fall

- d. **incomes increase**
  - e. the prices of other products increase
6. When demand for a good is inelastic, consumer expenditures on the good
- a. **increase when price increases**
  - b. decrease when price increases
  - c. do not change when price increases
  - d. are not related to price elasticity of demand
  - e. are relatively more elastic
1. If  $Q = 2L + 4K$ , which of the following is **false**?
- A. The MRTS is a constant equal to  $\frac{1}{2}$  if L is on the horizontal axis
  - B. The  $MP_K = 4$  units of output for each additional unit of K input
  - C. The production function displays constant returns to scale
  - D. K and L are perfect complements in production**
  - E. K and L are perfect substitutes in production
7. If average total cost is decreasing in the short run
- a. Total costs are decreasing
  - b. Average variable cost is decreasing
  - c. Marginal cost is decreasing
  - d. Marginal cost is less than average total cost**
  - e. B and D
8. You observe the following production relationship:  $F(aK, aL) > aF(K, L)$ . From this, you can conclude that
- a. the total cost of production is falling
  - b. the marginal product of L and K are increasing
  - c. there are increasing returns to scale**
  - d. you should expand production
  - e. c and d
9. If average fixed cost is 40 and average variable cost is 80 for a given output, we then know that average total cost is
- a. 40
  - b. 120**
  - c. 80
  - d. increasing
  - e. not possible to determine with the information given

10. If in the short run, a perfectly competitive firm is producing at an output where price is greater than the minimum of long run average cost
- The firm will necessarily make a profit in the long run
  - The firm will necessarily make a profit in the short run
  - The firm will have to reduce its price in the long run**
  - The firm will not cover its fixed costs
  - The firm will have exit in the long run
11. In a short-run production process, the marginal cost is rising and the average variable cost is falling as output is increasing. Thus,
- average fixed cost is constant
  - marginal cost is above average variable cost
  - marginal cost is below average fixed cost
  - marginal cost is below average variable cost**
  - average total cost is rising
12. For a firm operating in a perfect market, its short-run supply is identical with the rising arm of
- its marginal-cost curve where price > average-total-cost
  - its average-fixed-cost curve where price > average-total-cost
  - its average-total-cost curve where price > average-variable-cost
  - Its average-total cost curve where price > average-total-cost
  - Its marginal-cost curve where price > average-variable-cost**
13. In a consumer product Edgeworth box, a position on the contract curve
- is always preferred by consumers to some position off the contract curve.
  - is always more fair than some other position somewhere off the contract curve.
  - is always Pareto optimal**
  - is always defined where  $MRS_A = MRS_B$
  - is described by none of the above
14. In order to derive systematically the size of any single consumer good's Edgeworth box, we need to know
- the endowments of each consumer of each good**
  - the preferences of each consumer and their contract curve
  - either a or b because they both amount to the same information
  - both a and b plus the set of individual rational trades
  - the core of the economy

15. A movement from A to C represents
- A potential pareto improvement
  - A pareto improvement**
  - A movement from an inefficient allocation to an efficient allocation
  - A movement from an efficient allocation to an inefficient allocation
  - A movement away from an equilibrium allocation



16. In a Bertrand duopoly, each player tries to
- maximize its own profit**
  - maximize its own market share
  - maximize its price
  - minimize the profits of its opponents
  - minimize the market shares of its opponents
17. In a cartel, the incentive to cheat is significant because
- each firm has an incentive to decrease its own output
  - each firm has an incentive to raise its price
  - each firm has an incentive to expand its output**
  - each firm's marginal cost exceeds the price that the cartel sets
  - each firm has an incentive to deviate from the Nash equilibrium
18. When firms in monopolistic competition are earning an economic profit, firms will
- enter the industry, and demand will decrease for the original firms**
  - enter the industry, and demand will increase for the original firms
  - exit the industry, and demand will increase for the firms that remain
  - exit the industry, and demand will decrease for the firms that remain
  - expand production their production if they are a "first mover" firm

19. In order to be self-enforcing, an oligopoly strategy must:
- be a Nash equilibrium**
  - increase output
  - decrease output
  - maximize joint profit
  - earn each firm larger equilibrium profits
20. A monopolist faces a downward-sloping demand curve because
- its average revenue equals its marginal revenue
  - its supply curve is upward sloping
  - it sells typically to only one consumer
  - its demand curve is the market demand curve**
  - demand is perfectly inelastic.

### Section B: Short Answer – 20 points total

1. Explain the relationship between costs in the short run and costs in the long run. In your answer define what the “short run” means.

**In the short run at least one factor of production is fixed, thus firms face fixed costs in the short run. In the long run, all factors are variable. Long run costs will always be below short run costs – in fact, the long run average cost curve is the lower envelope of all short run average cost curves.**

2. List two factors that affect how price-elastic demand for a particular good is at a moment in time and explain

**Two factors that affect how price-elastic demand is include the availability of substitutes and whether the good is a normal or inferior. The availability of substitutes imply that consumers can shift their consumption away from a give good if the price increases without a large cost to utility. Whether a good is normal or inferior tells us whether the income effect works in the same direction as the substitution effect of a price change. If the income effect works in the opposite direction (as with an inferior good) the net change in quantity consumed from a price change will be less than if the income effect worked in the same direction.**

**Other factors that affect the price elasticity of demand include how big a component of a consumer’s total expenditures goes toward a particular good (this will influence the size of the substitution effect). Another factor is time. With more time, a consumer is able to rearrange their consumption bundle to allow for a greater reduction in consumption of an expensive good (for example in the short run, a consumer may not be able to substitute away from gas very easy, but in the long run they may switch from an SUV to a hybrid to avoid the costs of gas).**

3. Define what is a *long-run equilibrium* in a perfectly competitive, endowment economy.

**A long-run equilibrium is where:**

1. Consumers are maximizing their utility
2. Consumers are on their budget constraints (spending all their income)
3. Supply for a good equals demand for all goods
4. Rank the following market structures in terms of the highest equilibrium price to the lowest: perfect competition, Stackleberg competition, monopoly, Cournot competition, Bertrand competition, shared monopoly

**Monopoly, shared monopoly, cournot, stackleberg, bertrand**

**Section C: Long Answer – 80 points total**

1. Xiaoyu spends all her income on statistical software (S) and clothes (C). Her preferences can be represented by the utility function:  $U(S, C) = 4 \ln(S) + 6 \ln(C)$ 
  - a. Compute the marginal rate of substitution software for clothes (software is on the vertical axis). Is the MRS increasing or decreasing in S? How do we interpret this?

$$MRS = \frac{MU_C}{MU_S} = \frac{6}{c} \times \frac{S}{4} = \frac{3S}{2C}$$

**The MRS is increasing in S. This means as Xiaoyu gets more software, she is willing to give up more software to get an additional unit of clothes.**

- b. Find Xiaoyu's demand functions for software and clothes,  $Q_S(P_S, P_C, M)$  and  $Q_C(P_S, P_C, M)$ , in terms of the price of software ( $P_S$ ), the price of clothes ( $P_C$ ), and Xiaoyu's income ( $M$ )

$$\begin{aligned} \frac{3S}{2C} &= \frac{P_C}{P_S} \rightarrow S = \frac{2P_C C}{3P_S} \\ M &= P_S S + P_C C \\ M &= P_S \left( \frac{2P_C C}{3P_S} \right) + P_C C \\ M &= \frac{2P_C}{3} C + P_C C \rightarrow M = \frac{5}{3} P_C C \rightarrow C^* = \frac{3M}{5P_C}, S^* = \frac{2M}{5P_S} \end{aligned}$$

- c. Find Xiaoyu's optimal bundle of software and clothes if her income is \$100 and the price of software is 2 and the price of clothes is 3.

$$C^* = \frac{3(100)}{5(3)} = 20, S^* = \frac{2(100)}{5(2)} = 20$$

2. The government of a country called “Regula” currently guarantees its 10,000 wheat farmers a price of  $P=30$  per bushel of wheat, and does not allow new farmers to start growing wheat. Furthermore, the government forbids imports or exports of wheat (Regula is a closed economy in this entire question). The short-run cost function of each farm in Regula is  $C(q_i) = 0.5q_i^2 + 4q_i + 200$  where  $q_i$  is the farm’s output in bushels of wheat. Aggregate demand for wheat is given by  $Q = -10,000P + 400,000$ .
- a. Derive the supply curve of wheat in Regula.

**The supply curve in a competitive market is equal to marginal cost as long as price is greater than average variable cost.**

**Marginal cost curve:  $\frac{\partial C(q_i)}{\partial q_i} = q_i + 4$ , in a competitive market, price equals marginal cost for the optimizing firm so, so the supply curve for an individual firm is  $P = q_i + 4$  as long as price > AVC. Thus the supply curve for the whole industry is  $\Sigma q_i = -40,000 + 10,000P \rightarrow Q = -40,000 + 10,000P \rightarrow P = \frac{1}{10,000}Q + 4$ .**

A UVic economics student has worked for a coop term at the Regula government and advised allowing farmers to produce wheat under competitive circumstances.

- b. Compute the price per bushel of wheat immediately after the implementation of the student’s proposal.

**Supply will equal demand:**

$$\begin{aligned} Q_D &= 400,000 - 10,000P \\ Q_S &= 10,000P - 40,000 \end{aligned}$$

$$Q_S = Q_D \rightarrow 400,000 - 10,000P = 10,000P - 40,000 \rightarrow 440,000 = 20,000P \rightarrow 22 = P^*$$

$$\text{Thus } Q^* = 10,000(22) - 40,000 = 180,000$$

A UBC coop student also worked for a coop term at the Regula government. This student values growing produce locally and advised the government to split the market into 10,000 local communities, and to allow each of the 10,000 farmers to serve just one such local community.

- c. If demand in each local community is  $Q=40-P$ , what would be the price per bushel of wheat and the quantity in each local community if the proposal of the UBC coop student was implemented.

**Now each farmer has a monopoly! So  $MR = MC$ , but MR no longer equals the price. Recall the monopolist’s problem:**

$$\begin{aligned} & \text{Max}_Q PQ - C(Q) \\ & \text{Max}_Q (40 - Q)Q - 0.5Q^2 - 4Q - 200 \end{aligned}$$



$$40Q - Q^2 - 0.5Q^2 - 4Q - 200 \rightarrow 40Q - 1.5Q^2 - 4Q - 200$$

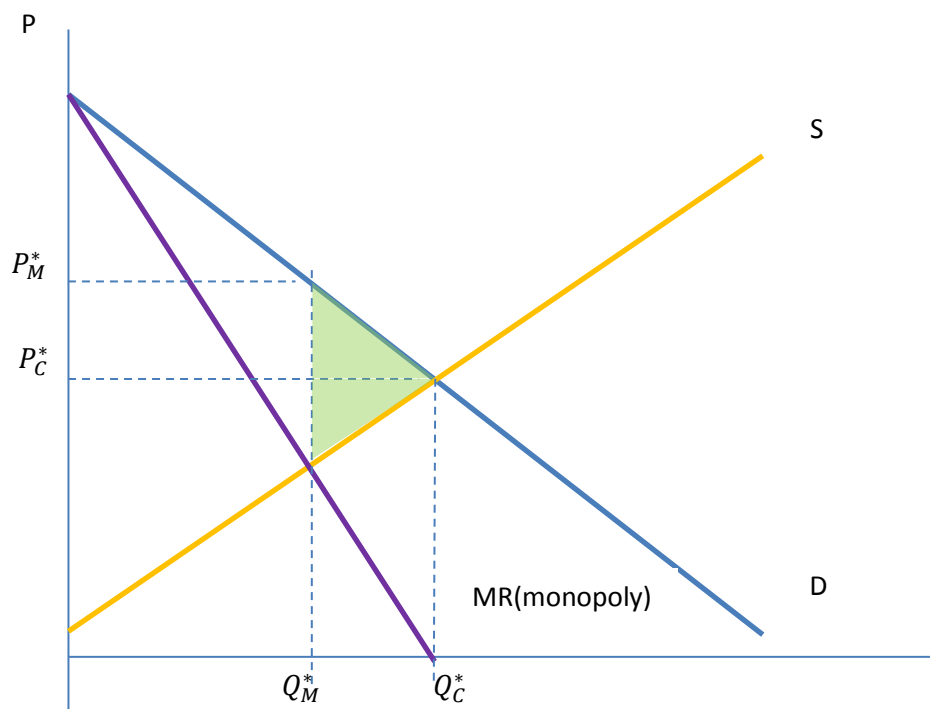
First order condition:

$$0 = 36 - 3Q \rightarrow 12 = Q_M^*$$

$$P_M^* = 40 - Q_M^* \rightarrow P_M^* = 28$$

The total quantity produced in the whole economy is 120,000

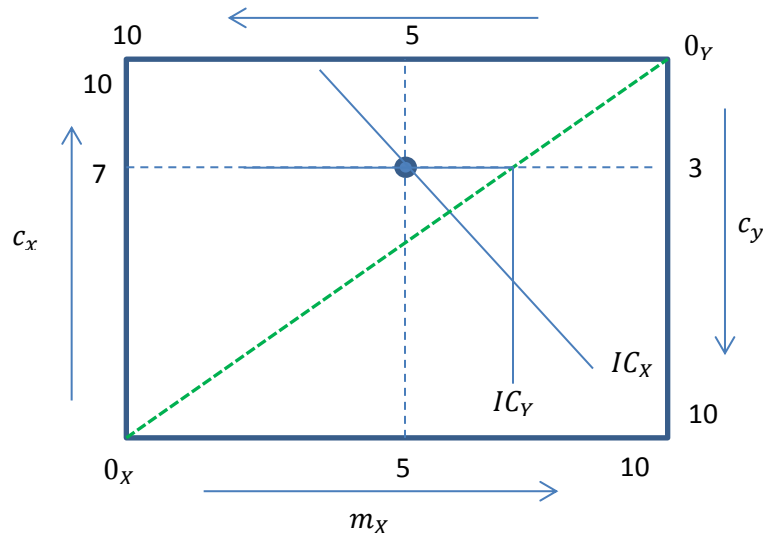
- d. Using a diagram and words explain whether the UBC students proposal of the UVic students proposal will result in higher social welfare.



More is produced for a lower cost under perfectly competitive markets than under monopoly. In the competitive outcome  $MC=MB$  so social welfare is maximized. The green triangle is the DWL from monopoly.

3. Xuan's preferences over milk and cookies are given by  $U_x(m, c) = m + c$ . Yuan's preferences over milk and cookies are given by  $U_y(c, m) = \min\{m, c\}$ . Yuan's endowment is 5 units of milk and 3 units of cookies. Xuan's is 5 units of milk and 7 units of cookies.

- a. Draw an edgeworth box for this economy where Xuan's milk is on the horizontal axis. Label Xuan and Yuan's endowment point and draw their indifference curves. Make sure all items are labelled.



- b. Give an equation for the contract curve and draw in on your box. Is the trade where Yuan give's Xuan 1 unit of milk in exchange for 1 cookie result in a pareto efficient allocation and is it a trade that would actually occur? Explain.

**The green line is the contract curve - it is given by  $c_x = m_x$  (or equivalently,  $c_y = m_y$ ). Yes to both because it is on the contract curve and the core. (Yuan having four units of both would put her on a higher indifference curve while leaving the utility of Xuan unchanged).**

4. Cournot duopolists face a market demand curve given by  $P = 90 - Q$ , where  $Q$  is total market demand in units. Each firm can produce output at a constant marginal cost of \$30/unit.
- a. What is the equilibrium price and quantity produced by each firm?

First find the reaction function for each firm.

$$\text{Firm 1: } \text{Max}_{q_1} \{P(q_1 + q_2)q_1 - 30q_1\} = \text{Max}_{q_1} \{90q_1 - q_1^2 - q_2q_1 - 30q_1\}$$

$$\text{F.O.C: } 90 - 2q_1 - q_2 - 30 = 0$$

$$R_1(q_2) = q_1 = \frac{60 - q_2}{2}$$

And since firm 2 is identical:

$$R_2(q_1) = q_2 = \frac{60 - q_1}{2}$$

Setting these equal to each other give you:  $q_1^* = 30 - \frac{1}{2}q_1^* \rightarrow \frac{3}{2}q_1^* = 30 \rightarrow q_1^* = 20, q_2^* = 20$

$$P^* = 90 - 40 = 50$$

- b. What if the firm's engaged in Bertrand competition?

The price would equal 30 and the firms would split the market. Using the demand curve:

$$30 = 90 - (q_1 + q_2) \rightarrow 60 = q_1 + q_2 \rightarrow q_1^* = q_2^* = 30$$

- c. What if one of the firms chose its quantity before its competitor?

This is stackleberg competition. The firm that moves first can strategically use the fact the other firm will have to best respond to a fixed quantity they could first.

So firm 2 (the second moving firm) will best respond to taking the quantity of the firm that moves first as given. This is the same problem as for the firm in the cournot model so  $R_2(q_1) = q_2 = \frac{60 - q_1}{2}$ .

$$\text{For firm 1: } \text{max}_{q_1} P(q_1 + R_2(q_1))q_1 - 30q_1 = \left(90 - q_1 - \left(\frac{60 - q_1}{2}\right)\right)q_1 - 30q_1 = 90q_1 - q_1^2 - 30q_1 + \frac{1}{2}q_1^2 - 30q_1 = 30q_1 - \frac{1}{2}q_1^2$$

**F.O.C:  $30 - q_1 = 0 \rightarrow 30 = q_1 \rightarrow q_1^* = 30$**

**Given this, firm 2, will play  $R_2(q_1^*) = q_2^* = \frac{60-30}{2} = 15$**

**So the price will be  $P^* = 90 - 45 = 45$**

- d. The firms merge and realise they can serve a new market that has a demand curve  $P = 50 - \frac{1}{2}Q$ . Call this Market A and the other Market B. Consumers aren't capable of arbitrage. What is the profit maximizing strategy of the monopolist?

**The monopolist should engage in 3<sup>rd</sup> degree price discrimination and charge a price in each market such that  $MR_1 = MR_2 = MC$ .**

**To find the price and quantity produced in the new market:  $MR_1 = 50 - Q_1 = MC = 30 \rightarrow Q_1 = 20, P_1 = 40$**

**In the old market:  $MR_2 = 90 - 2Q_2 = MC = 30 \rightarrow 60 = 2Q_2 \rightarrow Q_2 = 30, P_2 = 60$**