

Please ensure that you include your full name at the upper portion of this page. Carefully review all the instructions and write your answers in space provided. To receive maximum credit, it is imperative that you show all your work.

SECTION I: MULTIPLE CHOICE QUESTIONS (40 POINTS)

1. (5 points) Every week since lockdown, Ben spends his entire budget to purchase 2 boxes of fried chicken and 3 cream puffs. Each box of fried chicken costs \$8 and each cream puff costs \$5. Suppose Ben's marginal utility from fried chicken and cream puffs is 12. What should Ben do if he wants to increase his utility?
 - a. Increase fried chicken consumption and reduce cream puff consumption.
 - b. Increase cream puff consumption and reduce fried chicken consumption.
 - c. Increase both cream puff and fried chicken consumption.
 - d. Maintain current consumption.

2. (5 points) When Ester (my dog) wakes up in the morning, she will either purchase Timbits (x_1) or a bagel (x_2). This is represented by the utility function $u(x_1, x_2) = 15x_1 + 10x_2$. In addition, the price of a bagel is \$2 and the price of Timbits is \$0.50 apiece. Ester has a daily budget of \$5 to spend on breakfast. She is planning to purchase 1 Bagel (x_2) and 6 Timbits (x_1). Is this allocation of goods utility-maximizing?
 - a. No, Ester should consume Timbits only and no bagels
 - b. No, Ester should consume bagels only and no Timbits
 - c. Yes, since this bundle lies on Ester's budget line
 - d. Yes, since $MU_1/p_1 = MU_2/p_2$.

3. (5 points) What happens to the quantity demanded for a good in a particular market when all of the individual demand in this market for this good is cut in half? Assume the price level is unchanged.
 - a. The result is no change to the market demand curve as the new individual demand curves are still proportional to their original demand curves.
 - b. This results in 1/2 the quantity demanded in the market demand curve.
 - c. This results in 1/8 the quantity demanded in the market demand curve.
 - d. The result is no change to the market demand curve as the market demand curve is independent of the change in individual demand curves.

4. (5 points) Which of the following statements are FALSE?
 - a. If the TRS is constant, input 1 and input 2 are perfect complements in production.

- b. When isoquants are L-shaped, input 1 and input 2 must be used in fixed proportions during production.
 - c. When isoquants are straight lines, the TRS is constant. The rate at which input 1 and input 2 can be substituted for each other is always the same, independent of the level of inputs used.
 - d. Diminishing marginal returns is only applicable in the short-run.
5. (5 points) Which of the following statements is false:
- a. When marginal cost equals average cost, the average cost is minimized.
 - b. When marginal cost $>$ average cost, the average cost is increasing.
 - c. When marginal cost $>$ average cost, the average cost is decreasing.
 - d. When marginal cost $<$ average cost, the average cost is decreasing.
6. (5 points) Assume that perfectly competitive firms in a decreasing-cost industry (due to technology advancement) are earning economic profits. Determine the validity of the following statements. In the long-run:
- I. the market price will decrease.
 - II. the marginal cost of production will decrease.
- a. Both I and II are false.
 - b. I is true, and II is false.
 - c. I is false, and II is true.
 - d. Both I and II are true.
7. (5 points) Demand curves have a negative slope because
- a. firms tend to produce less of a good that is more costly to produce.
 - b. the substitution effect always leads consumers to substitute higher quality goods for lower quality goods.
 - c. the substitution effect always causes consumers try to substitute away from the consumption of a commodity when the commodity's price rises.
 - d. an increase in price reduces real income and the income effect always causes consumers to reduce consumption of a commodity when income falls.
8. (5 points) A prisoners' dilemma is a game with all of the following characteristics *except*
- a. players cooperate in arriving at their strategies.
 - b. both players have a dominant strategy.
 - c. both players would be better off if neither chose their dominant strategy.

- d. the payoff from a strategy depends on the choice made by the other player.
- e. both players have the same set of strategies.

SECTION II: LONG ANSWER QUESTIONS (110 POINTS)

1. (45 points) Dustin spends his income on two goods: food, x_1 ; and clothing, x_2 .
 - a. (6 points) The price food is $p_1 = 4$ and one piece of clothing costs $p_2 = 8$. Show geometrically Dustin's budget set if his income is $M = 120$. Find the relative price food in terms of clothing (one number)? Where can the relative price be seen in the graph of a budget set? (one sentence)

- b. (5 points) Dustin's preferences are represented by utility function

$$u(x_1, x_2) = x_1 x_2^2.$$

Take the natural logarithmic transformation of the utility function and denoting it as $v(x_1, x_2)$. Explain the idea behind "monotonic transformation" (one sentence).

- c. (6 points) Find marginal rate of substitution (MRS) for all bundles (derive formula). For bundle (2,2) and the value of MRS (one number). Give economic interpretation of MRS (one sentence). Which of the goods is more valuable given consumption (2,2)? Mark its value in the graph.
- d. (8 points) Write down the tangency condition and the budget constraint equation that determine optimal choice given parameters p_1 , p_2 and M . Explain economic intuition behind the two conditions (two sentences for each).

-
- e. (10 points) Using your answers in part d., derive optimal consumption x_1^* , x_2^* as a function of p_1 , p_2 , and M . (do not plug in the values for p_1 , p_2 , and M).
- f. (4 points) Using your answers in part e., argue using calculus that the two commodities are 1) normal and 2) neither complements nor substitutes.

- g. (6 points) Using your answers in part e., calculate the optimal consumption bundle (x_1^*, x_2^*) , given $p_1 = 4$, $p_2 = 8$, and $M = 120$ (give two numbers). Is the solution corner or interior (choose one). Mark both numbers in the graph.

2. (35 points) A producer has the following technology:

$$y = f(x_1, x_2) = \sqrt{2x_1 + 2x_2}$$

- a. (4 points) Show whether this production function exhibits CRS, IRS, or DRS by 1) using numerical example *and* 2) formal argument using t .

- b. (15 points) Find analytically (the variable) cost function given prices of inputs $w_1 = 4$ and $w_2 = 8$ (formula). Plot the cost function in the graph. Using calculus, is the slope of the cost function constant, increasing, or decreasing in y ? What is the economic term used to describe the slope you identified? Can you derive a supply curve for this competitive firm? Why or why not?
- c. (4 points) Given fixed costs of $FC = 4$, what is the long-run equilibrium quantity and price in this industry? (give two numbers).

- d. (4 points) Using your answers in part c., determine the number of firms operating in the industry if demand is $Q(p) = 20 - p$, firms are competitive and there is free entry in the market. (one number).
- e. (4 points) Show that the long-run profit for all the firms in the industry is zero. Describe the factors that drive profits to zero in perfectly competitive markets in the long-run.

Now suppose that the number of consumer increases such that the industry demand curve shifts out and is given by,

$$Q(p) = 40 - p.$$

- f. (2 points) What will be the new long-run equilibrium quantity and price in this industry? Explain.

- g. (2 points) How many firms will be operating in the industry? Is it higher or lower? (choose one). Explain.

3. (30 points) Consider a strategic interaction, in which Saniya and Vinicius have the choice to wear a Mask in Spring 2020 or wear No Mask. Wearing a mask is uncomfortable, but it reduces of risk of transmitting COVID. Their payoffs (measured in dollars) for four possible strategy sets are listed in the table below.

		Vinicius	
		Mask	No Mask
Saniya	Mask	6, 6	0, 8
	No Mask	8, 0	2, 2

- a. (6 points) What strategy would you expect each player to choose? Why?
- b. (6 points) Draw a circle around the Nash equilibrium. What makes it an equilibrium?

-
- c. (6 points) Does this game illustrate a social dilemma? Why or why not?
- d. (4 points) What is the name of this game? Briefly describe one other real-world social interaction that could be analyzed using this game.
- e. (8 points) Now suppose that Saniya and Vinicius are friends who care about one another. Specifically, suppose that every \$1 received by Vinicius is worth \$0.50 to Saniya, and vice versa. How does this punishment change the game? Rewrite the payoffs in a new matrix and draw a circle around the new Nash equilibrium.