

EXAMINATION #2 VERSION B
“Consumers and Demand”
September 27, 2018

INSTRUCTIONS: This exam is closed-book, closed-notes. Calculators, mobile phones, and wireless devices are NOT permitted. Point values for each question are noted in brackets.

I. MULTIPLE CHOICE: Circle the one best answer to each question. Use margins for scratch work. [1 pt each—5 pts total]

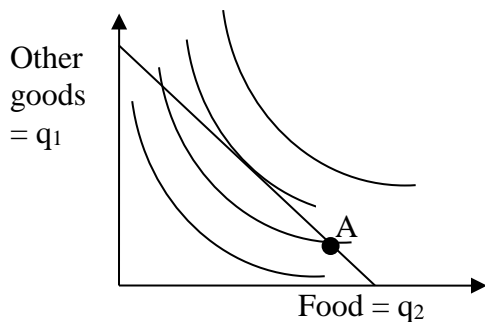
(1) The assumption of *diminishing marginal rate of substitution* implies that indifference curves

- a. slope up.
- b. slope down.
- c. get flatter as they approach the horizontal axis.
- d. get steeper as they approach the horizontal axis.
- e. none of the above.

(2) This consumer could enjoy higher utility, without increasing total spending, by

- a. purchasing less food and more other goods.
- b. purchasing more food and fewer other goods.
- c. purchasing less food and fewer other goods.
- d. any of the above.
- e. none of the above.

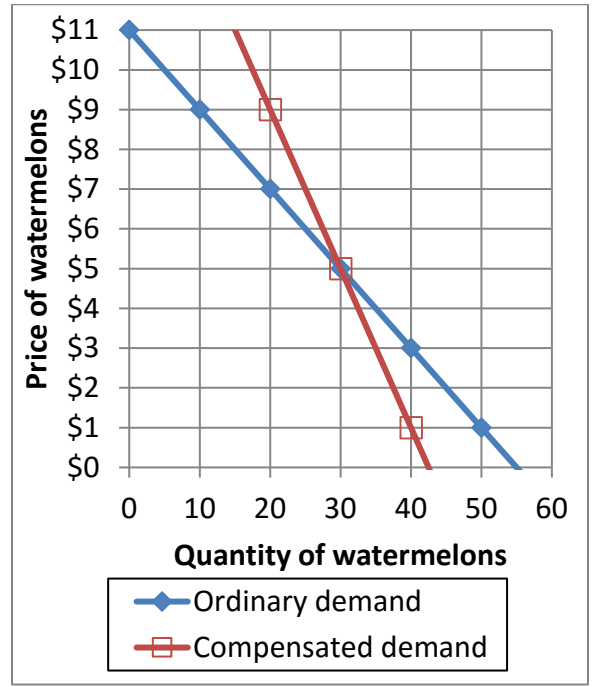
The next two questions refer to the following graph of a consumer's budget line and indifference curves. Suppose the consumer is currently at bundle A for some reason.



(3) Let MU_1 denote the marginal utility of other goods and MU_2 the marginal utility of food for this consumer. Let p_1 denote the price of other goods and p_2 denote the price of food. At bundle A,

- a. $MU_2 = MU_1$ and $p_2 = p_1$.
- b. $MU_2/MU_1 = p_2/p_1$.
- c. $MU_2/MU_1 < p_2/p_1$.
- d. $MU_2/MU_1 > p_2/p_1$.
- e. cannot be determined from information given.

The next two questions refer to the following graph of ordinary and compensated demand curves for watermelons.



(4) The increase in income that would exactly compensate consumers for a rise in price from \$5 to \$9, leaving consumers just as well off as before the price change, would be

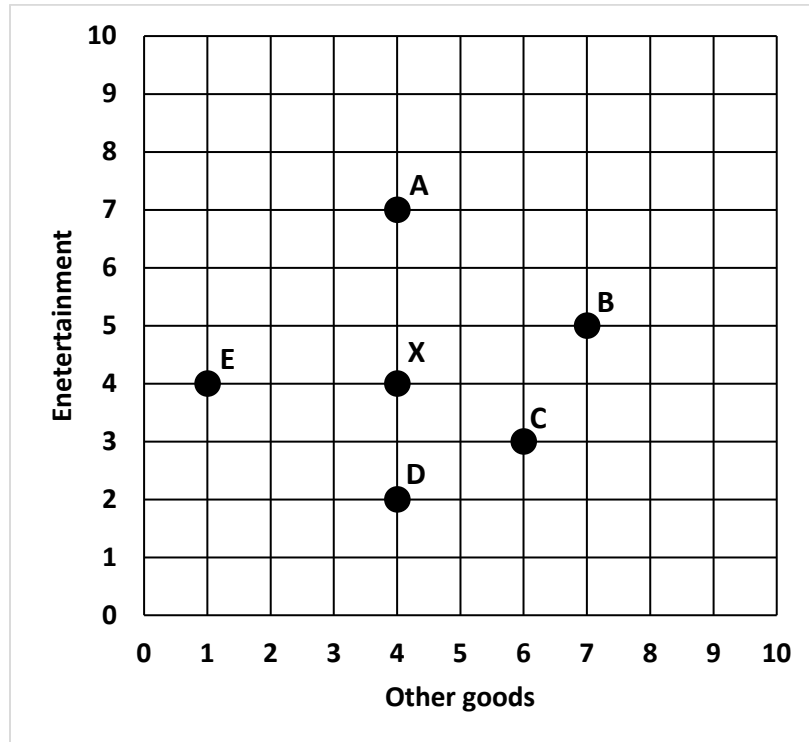
- a. \$4.
- b. \$80.
- c. \$100.
- d. \$120.
- e. none of the above.

(5) If the price rises from \$5 to \$9, then consumer surplus decreases by

- a. \$4.
- b. \$80.
- c. \$100.
- d. \$120.
- e. none of the above.

II. SHORT ANSWER: Please write your answers in the boxes on this question sheet. Use margins for scratch work.

(1) [Preferences: 5 pts] The graph below shows six bundles or combinations of goods.



The consumer's indifference curves are unknown, but the consumer's preferences are assumed to follow the assumption of *monotonicity*. Compare bundle X to the other five bundles from the consumer's perspective. In each box below, write "*more preferred than bundle X*," "*less preferred than bundle X*," or "*cannot be determined*."

a. Bundle A:

b. Bundle B:

c. Bundle C:

d. Bundle D:

e. Bundle E:

(2) [Price elasticity of demand: 10 pts] Suppose the price elasticity of demand for milk is -0.8 , and the price of milk rises by 5 %.

- a. Is the demand for milk *elastic* or *inelastic* ?
- b. Will the quantity demanded of milk *increase* or *decrease*?
- c. By about how much?
- d. Will consumers' total spending on milk *increase* or *decrease*?
- e. By about how much?

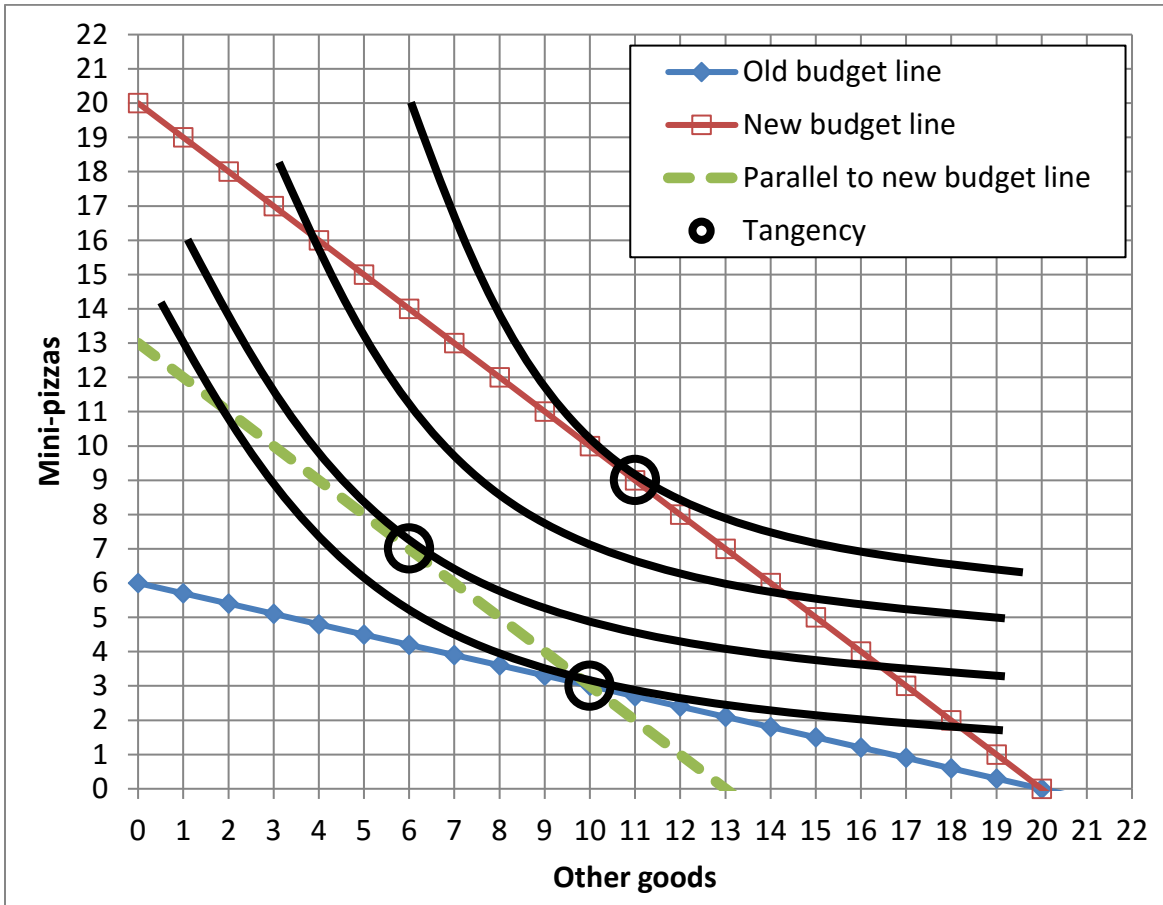
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(3) [Income elasticity of demand: 10 pts] Suppose that a consumer's income rises by 4%, and the income elasticity of demand for travel is 1.5 .

- a. Does the income elasticity indicate that travel is an *inferior* good, a *necessary* good, or a *luxury or superior* good?
- b. Will the quantity demanded of travel *increase* or *decrease*?
- c. By about how much?
- d. Will the share of the consumer's budget devoted to travel *increase* or *decrease*?
- e. By about how much?

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%

(4) [Substitution and income effects: 12 pts] Consider the indifference-curve diagram below. Assume the consumer has \$60 income.



- What was the price of mini-pizzas on the old budget line?
- Given the old budget line, how many mini-pizzas does the consumer demand?
- What is the price of mini-pizzas on the new budget line?
- Given the new budget line, how many mini-pizzas does the consumer demand?
- Compute the change in quantity of mini-pizzas demanded due to the substitution effect: Δq^{sub} .
- Compute the change in quantity of mini-pizzas demanded due to the income effect: Δq^{inc} .

\$	
	mini-pizzas
\$	
	mini-pizzas
	mini-pizzas
	mini-pizzas

(5) [Slutsky equation: 10 pts] The Slutsky equation in elasticity form is given by

$$\epsilon = -S \eta + \epsilon^{\text{comp}}$$

where, as usual, ϵ denotes the own-price elasticity of demand, S denotes the share of total consumer spending devoted to the good (a fraction), η denotes the income elasticity of demand, and ϵ^{comp} denotes the compensated demand elasticity. Suppose that for housing, $\epsilon = -0.9$, $S = 0.25$, and $\eta = 0.8$.

a. Compute the compensated demand elasticity (ϵ^{comp}).

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Suppose the price of housing rises by 10%, but the consumer's income does *not* change.

b. Does the quantity demanded of housing *increase* or *decrease*?

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c. By about how much?

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d. How much of this change is due to the income effect alone?

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e. How much of this change is due to the substitution effect alone?

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(6) [Cost-of-living indexes: 6 pts] Suppose we are given the following data on prices and quantities consumed of energy and other goods.

	Energy		Other goods	
	Price	Quantity	Price	Quantity
Old period	\$4	5 units	\$5	6 units
New period	\$4	15 units	\$6	8 units

Assume that all cost-of-living indexes equal 100 in the old period.

a. Compute the *value* of the Laspeyres cost-of-living index in the new period.

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b. Compute the *value* of the Paasche cost-of-living index in the new period.

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c. Give a *formula* for the Fisher cost-of-living index in the new period.

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III. PROBLEMS: Please write your answers in the boxes on this question sheet. Show your work and circle your final answers.

(1) [Budgets and choice: 14 pts] A consumer has the following utility function:

$U(q_1, q_2) = q_1^2 (q_2 - 10)$, where q_1 denotes the quantity of cupcakes and q_2 denotes the quantity of other goods. The price of cupcakes is \$6 and the price of other goods is \$3. The consumer has \$75 in income to spend on these items.

- a. [4 pts] Give an equation for the consumer's budget line. The variables q_1 and q_2 should be the only unknowns.

- b. [4 pts] Find a formula for the consumer's marginal rate of substitution in consumption of other goods for cupcakes—that is, the $|\text{slope}|$ of the consumer's indifference curve with cupcakes on the vertical axis and other goods on the horizontal axis. The variables q_1 and q_2 should be the only unknowns. Circle your final answer.

- c. [6 pts] Solve for the quantities of cupcakes (q_1^*) and other goods (q_2^*) that this consumer will choose. Circle your final answers.

(2) [Properties of individual demand functions: 12 pts] Suppose an alleged demand function is

$$q_1^* = \frac{I + 2p_2}{p_1},$$

where I denotes the consumer's income, p_1 denotes the price of good #1,

and p_2 denotes the price of good #2.

- a. Is this function homogeneous of degree zero in income and prices? Justify your answer.

- b. Find the partial derivative $\partial q_1^* / \partial p_1$. Is good #1 an ordinary good or a Giffen good? Why?

- c. Find the partial derivative $\partial q_1^* / \partial I$. Is good #1 an inferior good or a normal good? Why?

- d. Find the partial derivative $\partial q_1^* / \partial p_2$. Are goods #1 and #2 substitutes, complements, or unrelated in demand? Why?

(3) [Finding individual demand functions: 12 pts] A consumer has the following utility function: $U(q_1, q_2) = q_1^2 q_2^3$, where q_1 denotes the quantity of housing and q_2 denotes the quantity of other goods.

- a. Find a formula for the consumer's marginal rate of substitution in consumption of other goods for housing—that is, the |slope| of the consumer's indifference curve with housing on the vertical axis and other goods on the horizontal axis. The variables q_1 and q_2 should be the only unknowns. Circle your final answer.

Let p_1 denote the price of housing and let p_2 denote the price of other goods. Let I denote the consumer's income.

- b. Solve for the consumer's demand function for housing—that is, the formula showing q_1^* as a function of p_1 , p_2 , and I (but not q_2). Show your work and circle your final answer. [Hint: check that your answer is homogeneous of degree zero.]

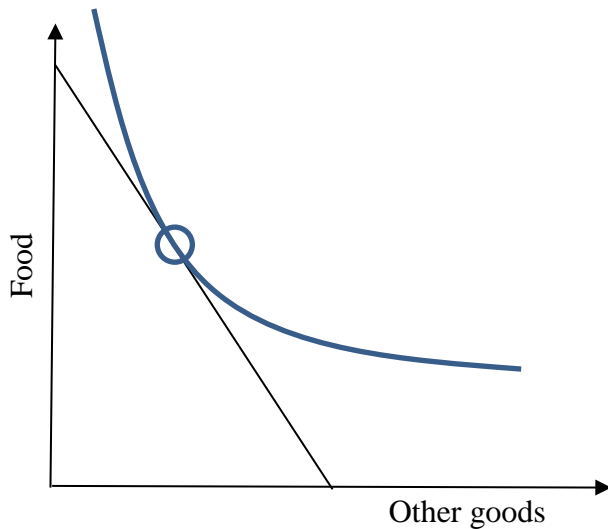
- c. Solve for the consumer's demand function for other goods—that is, the formula showing q_2^* as a function of p_1 , p_2 , and I (but not q_1). Show your work and circle your final answer. [Hint: check that your answer is homogeneous of degree zero.]

IV. CRITICAL THINKING: Answer just *one* of the questions below (your choice). [4 pts]

(1) Suppose that when the price of a particular item rises by 10%, consumer spending on the item rises by 7%. Is demand for this good *elastic*, *inelastic*, or *unitary elastic*? Explain your reasoning. Compute the price elasticity of demand. (Ignore the graph.)

(2) Suppose Abby initially buys 100 units of food per month. Now suppose that the price of food rises by \$3 per unit. Fortunately, at the same time, Abby's income rises by \$300 per month. Will Abby buy *more food*, *less food*, or the *same amount of food* as before? Justify your answer with either an indifference-curve diagram (started below), or an algebraic proof using the Slutsky equation.

Circle the question you are answering and write your answer below. Full credit requires good grammar, legible writing, accurate spelling, and correct reasoning.



[end of exam]