

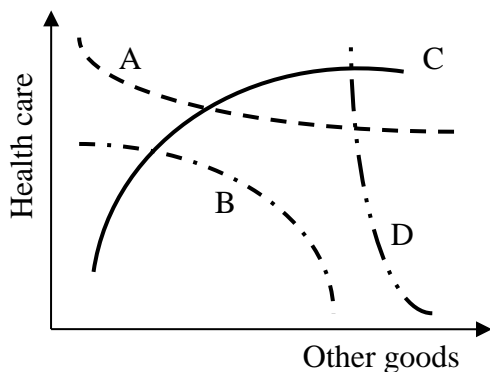
EXAMINATION #2 VERSION B
“Consumers and Demand”
September 26, 2019

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—7 pts total]

(1) Which indifference curve below violates the assumption of monotonicity?

- a. Curve A.
- b. Curve B.
- c. Curve C.
- d. Curve D.
- e. Curves B and C.
- f. None of the above.

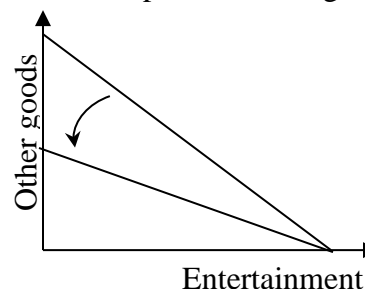


(2) All of the following utility functions yield the same formula for the marginal rate of substitution in consumption *except*

- a. $U(q_1, q_2) = 4 \ln(q_1) + \ln(q_2)$.
- b. $U(q_1, q_2) = 4 q_1 + q_2$.
- c. $U(q_1, q_2) = (q_1^4 q_2^1)^2 + 100$.
- d. $U(q_1, q_2) = q_1^4 q_2^1$.
- e. $U(q_1, q_2) = 10 q_1^{4/5} q_2^{1/5}$.

(3) In the graph below, the shift in the budget line could be caused by

- a. an increase in income.
- b. a decrease in income.
- c. an increase in the price of entertainment.
- d. a decrease in the price of entertainment.
- e. an increase in the price of other goods.
- f. a decrease in the price of other goods.



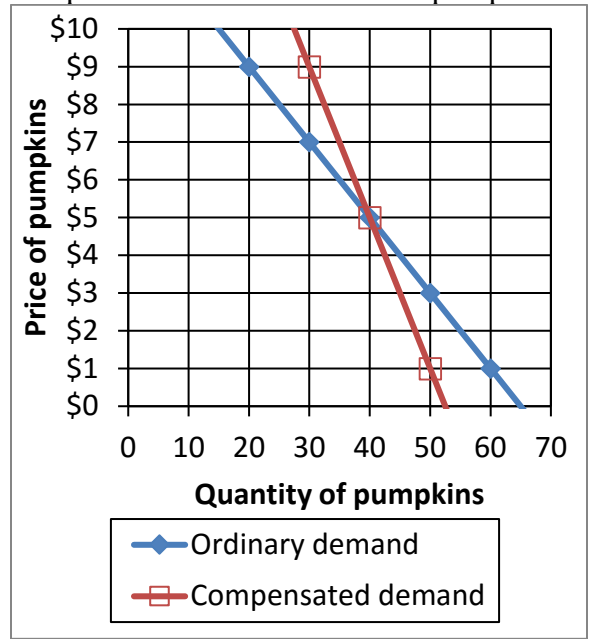
(4) If all prices and the consumer’s income double, then the consumer’s budget line

- a. becomes steeper.
- b. becomes flatter.
- c. shifts outward, away from the origin in parallel fashion.
- d. shifts inward, toward the origin in parallel fashion.
- e. None of the above.

- (5) Which price index tends to underestimate the rate of inflation?
- a. Laspeyres price index.
 - b. Paasche price index.
 - c. Fisher price index.
 - d. All of the above.
 - e. None of the above.

- (6) If the price rises from \$5 to \$9, then consumer surplus decreases by
- a. \$4.
 - b. \$120.
 - c. \$140.
 - d. \$160.
 - e. none of the above.

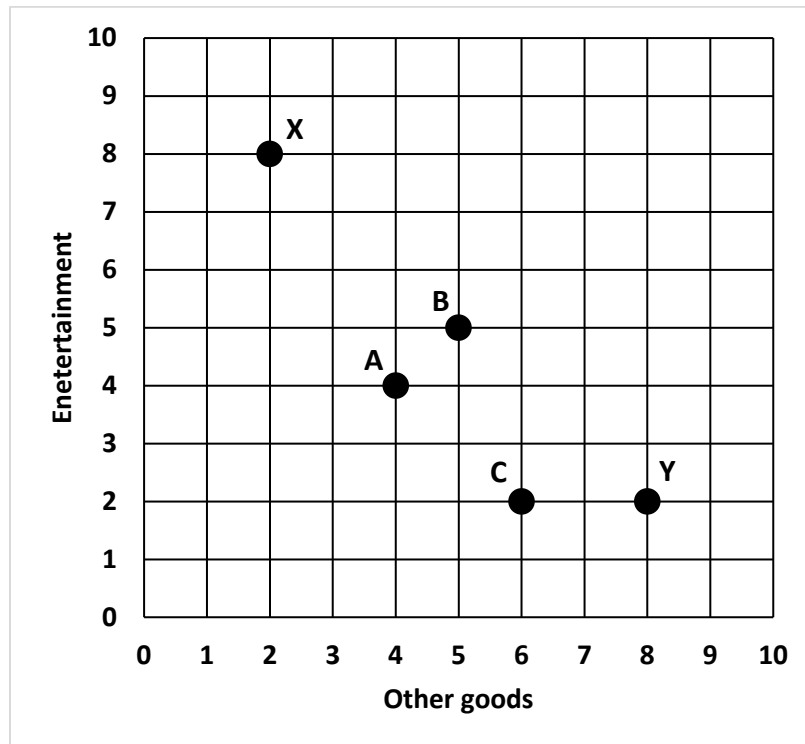
The next two questions refer to the following graph of ordinary and compensated demand curves for pumpkins.



- (7) 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. \$120.
 - c. \$140.
 - d. \$160.
 - 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: 3 pts] The graph below shows five bundles or combinations of goods.



The consumer's indifference curves are unknown, but the consumer's preferences are assumed to follow the assumptions of *monotonicity* and *diminishing marginal rate of substitution*. Suppose the consumer is indifferent between bundles X and Y. Compare the remaining bundles to X and Y from the consumer's perspective. In each box below, write "more preferred than bundles X and Y," "less preferred than bundles X and Y," "equally preferred to bundles X and Y," or "cannot be determined."

a. Bundle A:

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b. Bundle B:

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c. Bundle C:

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(2) [Price elasticity of demand: 10 pts] Suppose the price elasticity of demand for new cars is -2 , and the price of new cars rises by 3 %.

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

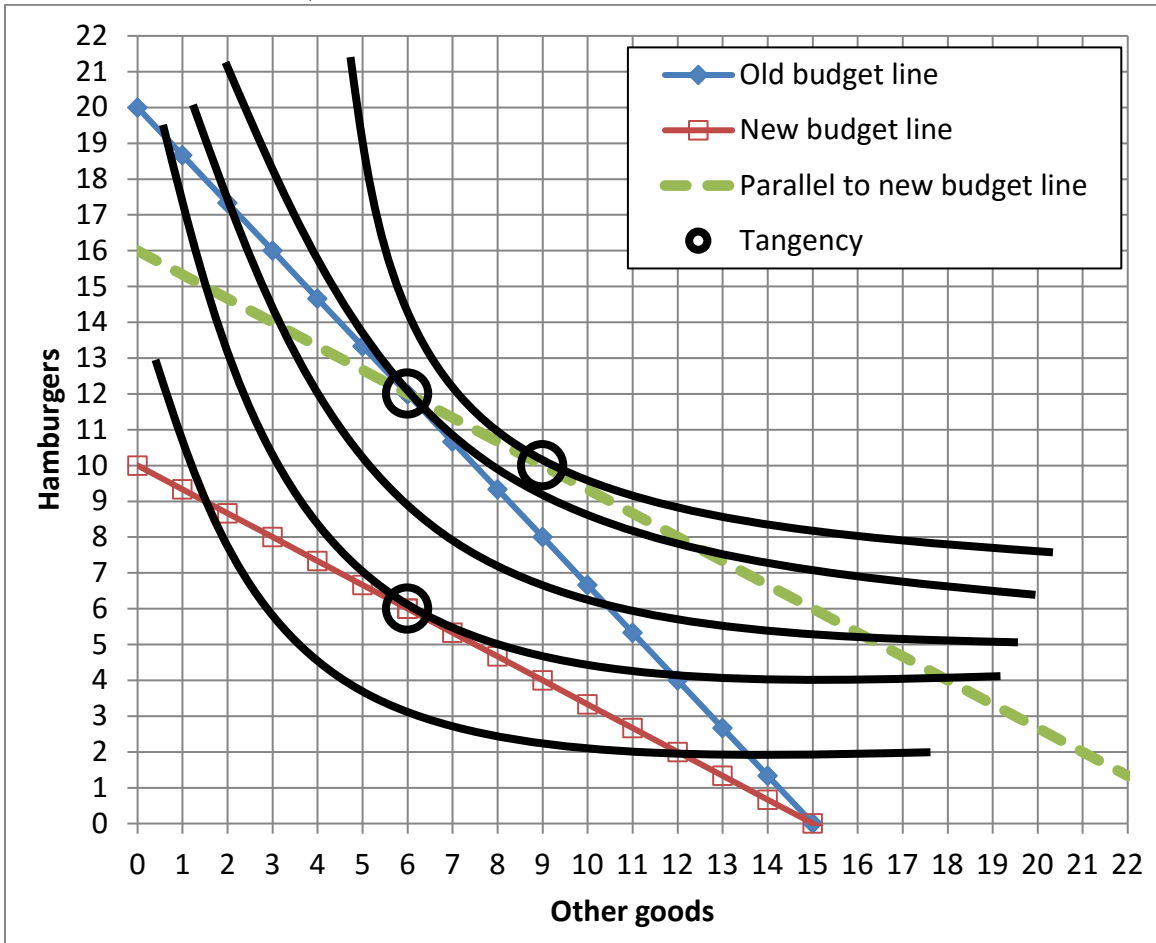
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(3) [Income elasticity of demand: 10 pts] Suppose that a consumer's income rises by 5%, and the income elasticity of demand for mobile phone service is 0.4 .

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

%
%

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



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

\$	
	hamburgers
\$	
	hamburgers
	hamburgers
	hamburgers

(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 electricity, $\epsilon = -1.2$, $S = 0.05$, and $\eta = 0.8$.

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

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

b. Does the quantity demanded of electricity *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 food and other goods.

	Food		Other goods	
	Price	Quantity	Price	Quantity
Old period	\$3	10 units	\$5	4 units
New period	\$4	25 units	\$10	5 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. The formula should include numbers but no variables.

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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:

$U(q_1, q_2) = (q_1 + 10)(q_2 + 5)$, where q_1 denotes the quantity of sandwiches and q_2 denotes the quantity of other goods. The price of sandwiches is \$5 and the price of other goods is \$6. The consumer has \$100 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 sandwiches—that is, the |slope| of the consumer's indifference curve with sandwiches 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 sandwiches (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 $q_1^* = 10 p_1^{-0.6} I^{0.6} p_2^{-0.1}$, 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? Justify your answer.

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

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

(3) [Finding individual demand functions: 12 pts] A consumer has the following utility function: $U(q_1, q_2) = q_1 q_2^4$, 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) Amanda's utility function is $U = q_1 q_2$, where q_1 denotes the quantity of food and q_2 denotes the quantity of other goods. Suppose the price of food is $p_1 = \$4$ and the price of other goods is $p_2 = \$5$. Compute the *minimum* amount of income that Amanda must have to attain a target level of utility of $U = 500$ utils. Show your work and circle your final answer.

(2) Suppose a consumer's demand function for good 1 takes the following form:

$$q_1^* = 5 p_1^\epsilon p_2^\alpha I^\eta,$$

where p_1 is the good's own price, p_2 is the price of another good, and I is the consumer's income. If the demand for good 1 is homogeneous of degree zero in all prices and income, then what must be the value of the *sum* of the exponents: $(\epsilon + \alpha + \eta)$? Justify your answer with algebra.

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]