

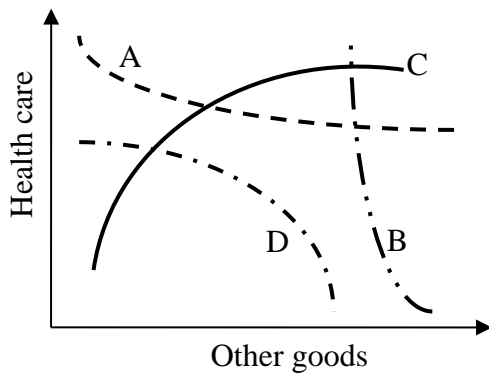
EXAMINATION #2 VERSION B
“Consumers and Demand”
September 28, 2017

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—4 pts total]

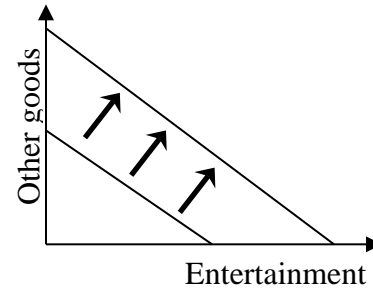
(1) Which indifference curve below violates the assumption of monotonicity?

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

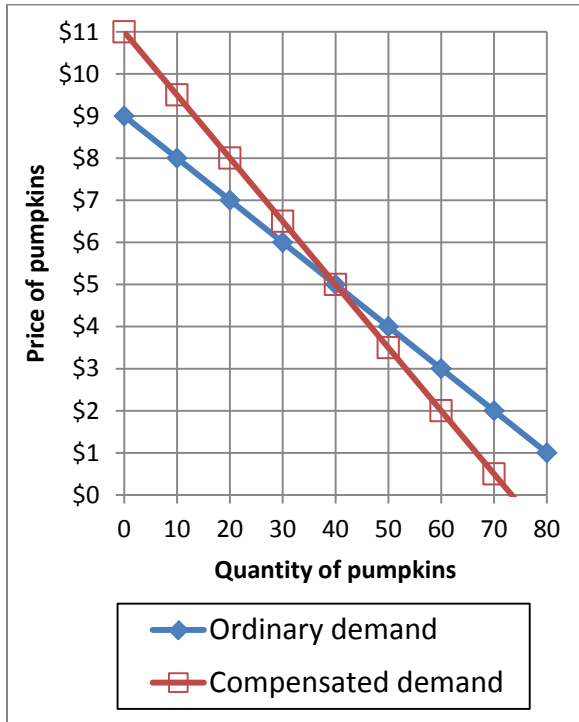


(2) In the graph below, the shift in the budget line could be caused by

- 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.



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



(3) The increase in income that would exactly compensate consumers for a rise in price from \$5 to \$8, leaving consumers just as well off as before the price change, would be

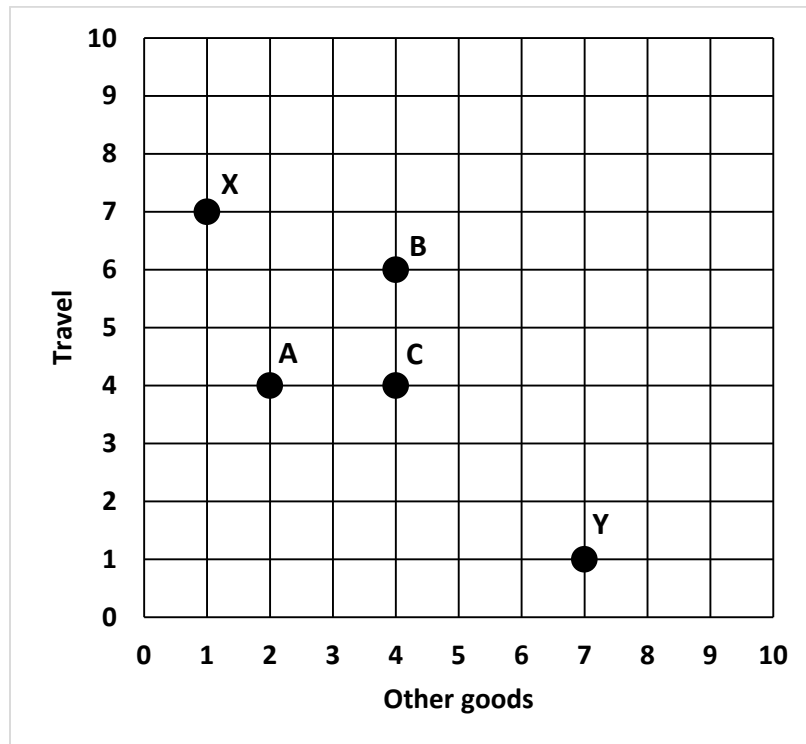
- a. \$3.
- b. \$75.
- c. \$90.
- d. \$120.
- e. none of the above.

(4) If the price rises from \$5 to \$8, then consumer surplus decreases by

- a. \$3.
- b. \$75.
- c. \$90.
- 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: 6 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 bundle X and Y*," "*equally preferred to X and Y*," or "*cannot be determined*."

a. Bundle A:

b. Bundle B:

c. Bundle C:

(2) [Price elasticity of demand: 10 pts] Suppose the price elasticity of demand for milk is -0.4 , and the price of milk falls by 10 %.

- 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?

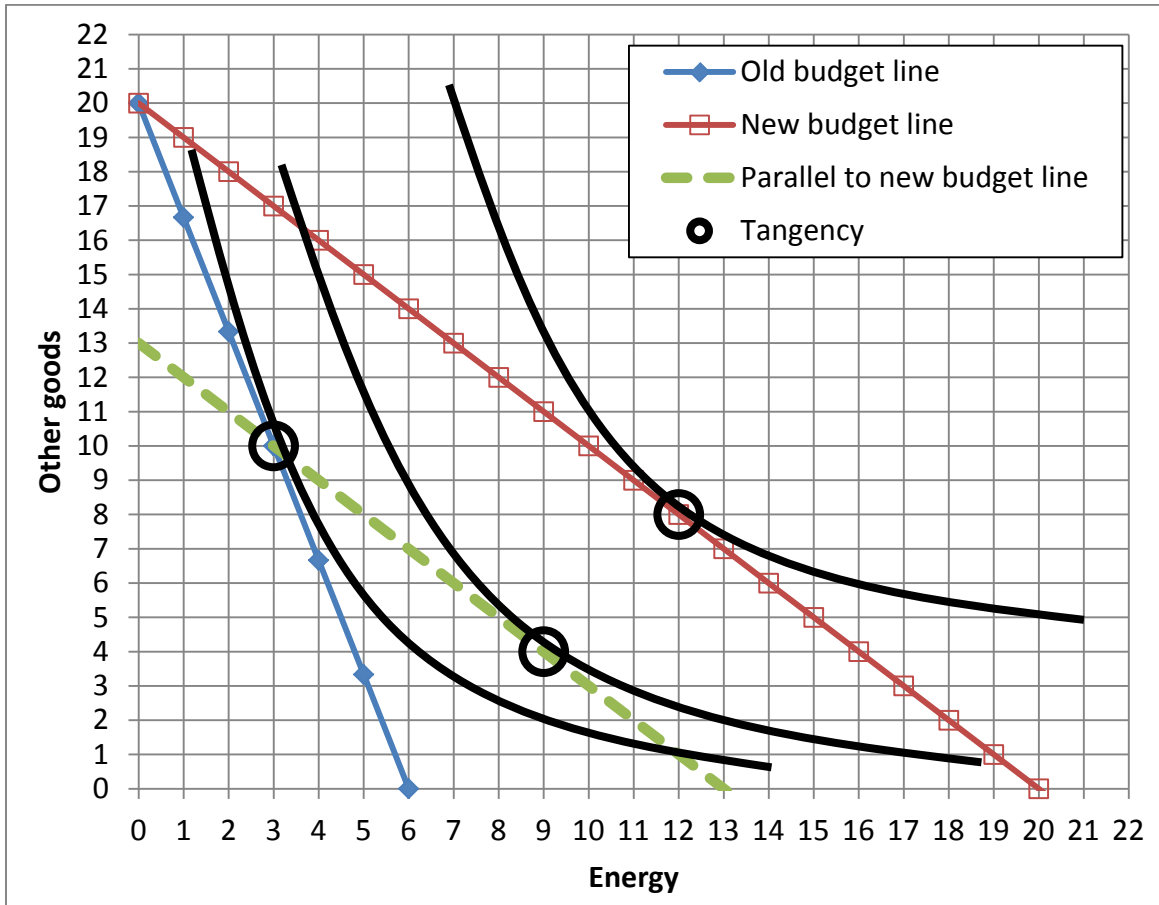
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(3) [Income elasticity of demand: 10 pts] Suppose that a consumer's income rises by 5%, and the income elasticity of demand for energy is 0.8 .

- a. Does the income elasticity indicate that energy is an *inferior* good, a *necessary* good, or a *luxury or superior* good?
- b. Will the quantity demanded of energy *increase* or *decrease*?
- c. By about how much?
- d. Will the share of the consumer's budget devoted to energy *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 energy on the old budget line?
- Given the old budget line, how much energy does the consumer demand?
- What is the price of energy on the new budget line?
- Given the new budget line, how much energy does the consumer demand?
- Compute the change in quantity of energy demanded due to the substitution effect: Δq^{sub} .
- Compute the change in quantity of energy demanded due to the income effect: Δq^{inc} .

\$	
	units
\$	
	units
	units
	units

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

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

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 travel, $\epsilon = -1.4$, $S = 0.05$, and $\eta = 2.0$.

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

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

b. Does the quantity demanded of travel *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 clothing and other goods.

	Clothing		Other goods	
	Price	Quantity	Price	Quantity
Old period	\$2	15 units	\$5	4 units
New period	\$4	20 units	\$5	12 units

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

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

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b. Compute 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:

$U(q_1, q_2) = -q_1^{-1} - q_2^{-1}$, where q_1 denotes the quantity of energy and q_2 denotes the quantity of other goods. The price of energy is \$1 and the price of other goods is \$4. The consumer has \$30 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 energy—that is, the |slope| of the consumer's indifference curve with energy 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 energy (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 $q_1^* = 0.2 p_1^{-0.4} I^{-0.1} p_2^{0.3}$, 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: $U(q_1, q_2) = q_1^4 q_2$, where q_1 denotes the quantity of gasoline 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 gasoline—that is, the |slope| of the consumer's indifference curve with gasoline 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 gasoline 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 gasoline—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 a consumer buys only coffee (q_c) and donuts (q_d). Suppose the prices of coffee (p_c) and donuts (p_d) both increase by exactly the same amount: 10%. That is,

$$p_c^{\text{new}} = 1.10 p_c^{\text{old}} \quad \text{and} \quad p_d^{\text{new}} = 1.10 p_d^{\text{old}}.$$

Which increases fastest—the *Laspeyres* cost-of-living index, the *Paasche* cost-of-living index, or the *Fisher* cost-of-living index? Prove your answer with algebra.

(2) Suppose a consumer normally buys 20 gallons of gasoline per month at a price of \$3. Which would this consumer prefer: a reduction in price from \$3 to \$1, or an increase in income of \$40? Justify your answer with a graph of a demand curve.

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]