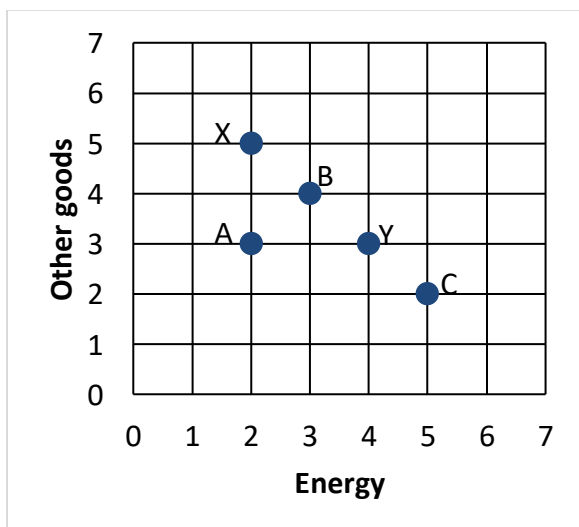


EXAMINATION #2 VERSION B
“Consumers and Demand”
September 30, 2021

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—10 pts total]

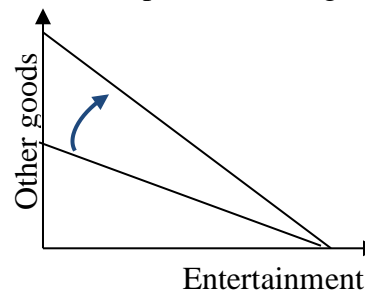
- (1) Suppose in the graph below that the consumer is indifferent between bundles X and Y. (Assume as usual that the assumption of "monotonicity" or "more is better" applies.) According to the assumption of "diminishing marginal rate of substitution," which bundle below *must* be preferred to bundles X and Y?
- Bundle A only.
 - Bundle B only.
 - Bundle C only.
 - All of the above.
 - None of the above.



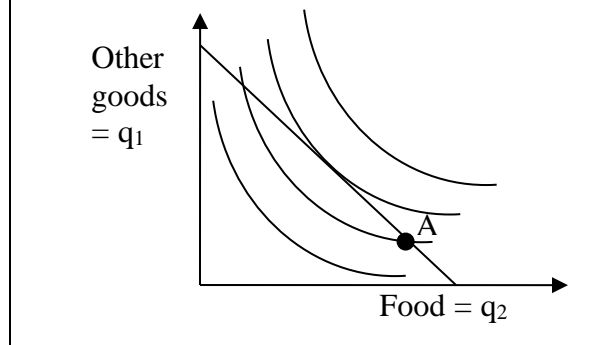
- (2) Which utility function below violates the assumption of "monotonicity" or "more is better"?

- $U(q_1, q_2) = q_1^2 q_2$.
- $U(q_1, q_2) = -2q_1^{-1} - q_2^{-1}$.
- $U(q_1, q_2) = 2q_1 / q_2$

- (3) In the graph below, the shift in the budget line could be caused by
- an increase in income.
 - a decrease in income.
 - an increase in the price of entertainment.
 - a decrease in the price of entertainment.
 - an increase in the price of other goods.
 - a decrease in the price of other goods.



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.



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

- purchasing less food and more other goods.
- purchasing more food and fewer other goods.
- purchasing less food and fewer other goods.
- any of the above.
- none of the above.

(5) 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,

- $MU_2 = MU_1$ and $p_2 = p_1$.
- $MU_2/MU_1 = p_2/p_1$.
- $MU_2/MU_1 < p_2/p_1$.
- $MU_2/MU_1 > p_2/p_1$.
- cannot be determined from information given.

(6) Which of the following demand functions exhibits a constant price elasticity of demand?

- $q_1^* = I/(2p_1) + 5$.
- $q_1^* = 10 p_1^{-0.8} I^{0.9} p_2^{-0.2}$.
- $q_1^* = 60 - 5 p_1 + 0.05 I - 0.01 p_2$.

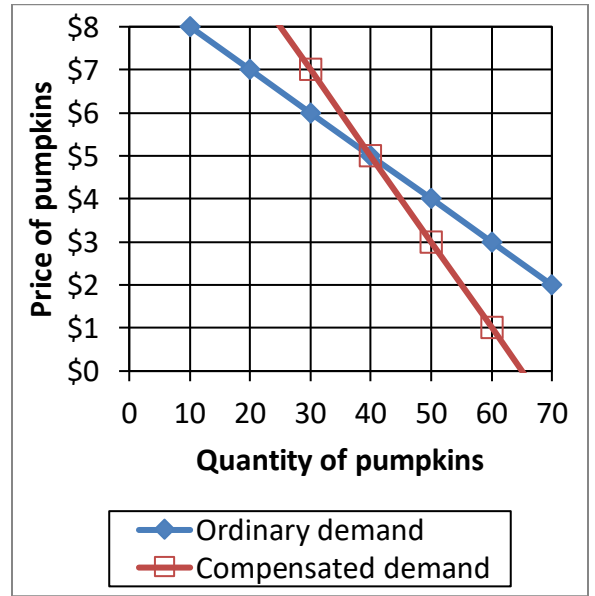
(7) Which price index tends to underestimate the rate of inflation?

- Laspeyres price index.
- Paasche price index.
- Fisher price index.
- All of the above.
- None of the above.

(8) As one moves along an *compensated* demand curve (sometimes called a "Hicksian" demand curve) for a particular good, the

- price of the good is held constant.
- quantity demanded of the good is held constant.
- the consumer's income is held constant.
- the consumer's utility is held constant.
- none of the above.

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



(9) Suppose the price of pumpkins rose from \$5 to \$7. The increase in income that would exactly compensate consumers for this rise in price, leaving consumers just as well off as before the price change, would be

- a. \$2.
- b. \$60.
- c. \$70.
- d. \$80.

(10) Again suppose the price of pumpkins rose from \$5 to \$7. The decrease in consumer surplus would be

- a. \$2.
- b. \$60.
- c. \$70.
- d. \$80.

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

(1) [Price elasticity of demand: 10 pts] Suppose the price elasticity of demand for seafood is -1.2 , and the price of seafood rises by 5 %.

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

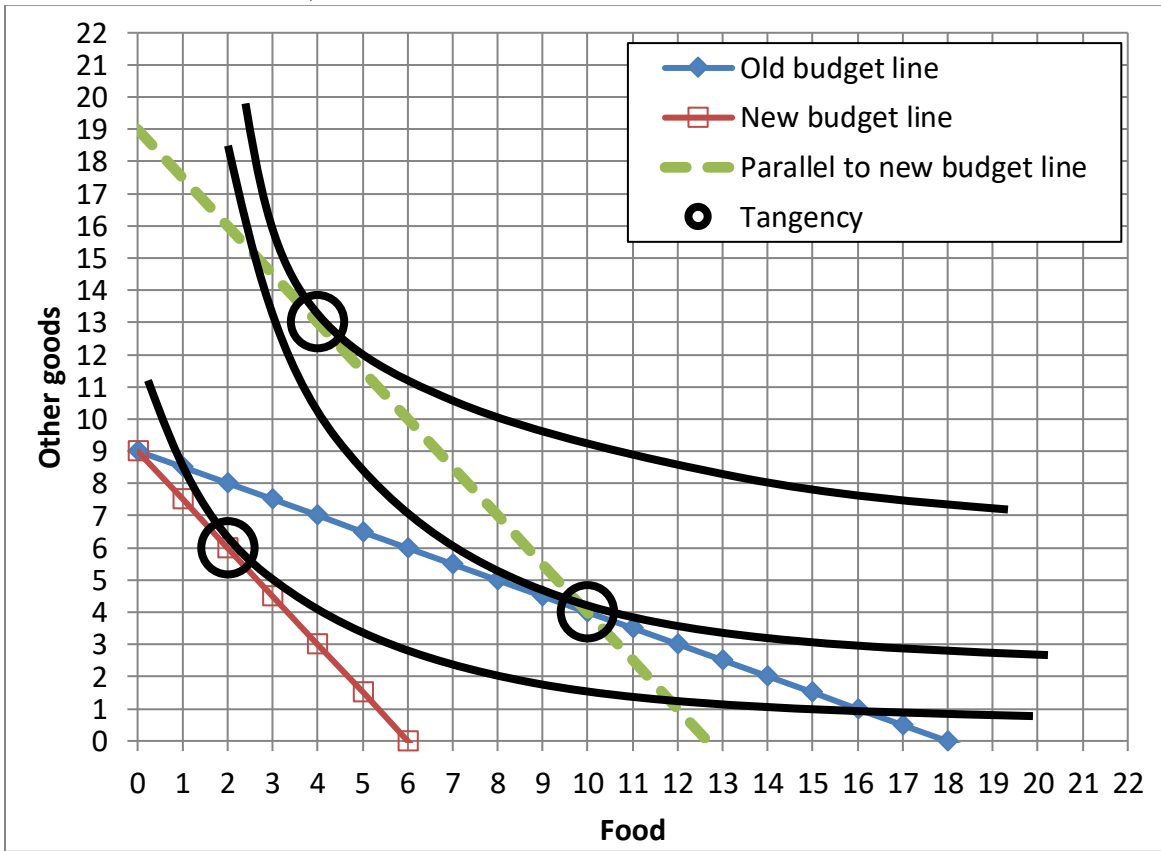
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(2) [Income elasticity of demand: 10 pts] Suppose that a consumer's income rises by 8%, and the income elasticity of demand for gasoline is 0.25 .

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

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(3) [Substitution and income effects: 12 pts] Consider the indifference-curve diagram below. Assume the consumer has \$36 income.



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

\$	
	units
\$	
	units
	units
	units

(4) [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, $\epsilon = -1.5$, $S = 0.2$, and $\eta = 1.5$.

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

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Suppose the price of electricity rises 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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Continue to assume that the price of electricity rises by 10%, but now suppose the government helps the consumer by giving them a cash transfer equal to 10% of last year's spending on electricity.

d. Does the quantity demanded of electricity *increase* or *decrease*?

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e. By about how much?

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(5) [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	\$5	6 units	\$10	2 units
New period	\$10	6 units	\$10	7 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:

$U(q_1, q_2) = -q_1^{-1} - q_2^{-1}$, where q_1 denotes the slices of pizza and q_2 denotes the quantity of other goods. The price of slices of pizza is \$4 and the price of other goods is \$9. The consumer has \$60 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 pizza—that is, the |slope| of the consumer's indifference curve with slices of pizza 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 slices of pizza (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 $q_1^* = \frac{0.1I + p_2}{p_1} + 6$, 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: $U(q_1, q_2) = q_1^3 q_2$, where q_1 denotes the quantity of entertainment 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 entertainment—that is, the $|\text{slope}|$ of the consumer's indifference curve with entertainment 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 entertainment 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 entertainment—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) Ana'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 $p_1 = \$3$ and the price of other goods is $p_2 = \$4$. Compute the *minimum* amount of income that Ana must have to attain a target level of utility of $U = 300$ utils. Show your work and circle your final answer.

(2) Suppose Bob buys only sandwiches (q_s) and Gatorade (q_g). Suppose the prices of both items double from the old period to the new period. That is,

$$p_s^{\text{new}} = 2 p_s^{\text{old}} \quad \text{and} \quad p_g^{\text{new}} = 2 p_g^{\text{old}}.$$

(However, we do not know what quantities Bob chooses in either period.) Which increases faster—Bob's *Laspeyres* cost-of-living index, his *Paasche* cost-of-living index, or his *Fisher* cost-of-living index? Justify your answer using 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]