ECON 173 - Intermediate Microeconomic Analysis
Drake University, Fall 2019
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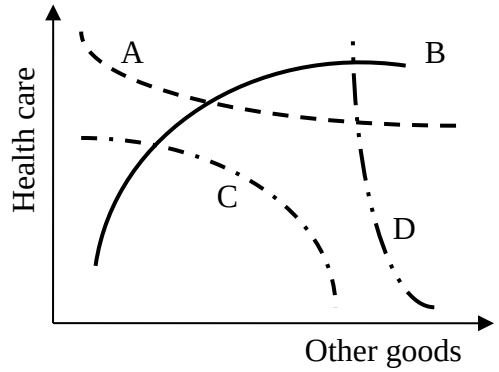
EXAMINATION #2 VERSION A
"Consumers and Demand"
September 26, 2019

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.

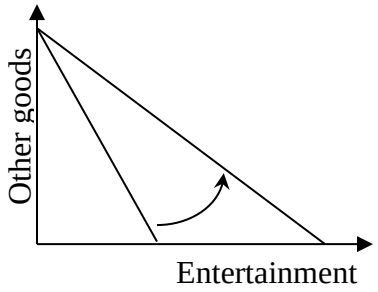


(2) All of the following utility functions yield the same formula for the marginal rate of substitution in consumption *except*

a. $U(q_1,q_2) = q_1^2 q_2^3$.
b. $U(q_1,q_2) = 10\, q_1^{2/5} q_2^{3/5}$.
c. $U(q_1,q_2) = 2 \ln(q_1) + 3 \ln(q_2)$.
d. $U(q_1,q_2) = 2 q_1 + 3 q_2$.
e. $U(q_1,q_2) = (q_1^2 q_2^3)^2 + 100$.

(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.

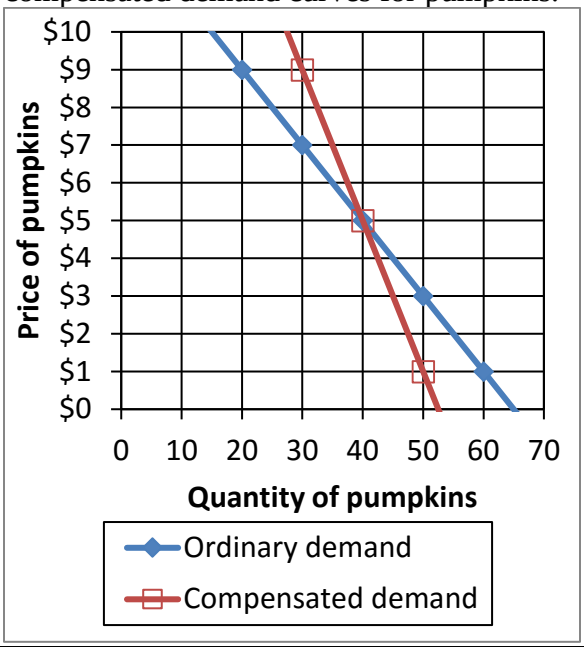


(4) If prices remain constant, but the consumer's income doubles, then the consumer's budget line

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 overestimate 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.

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

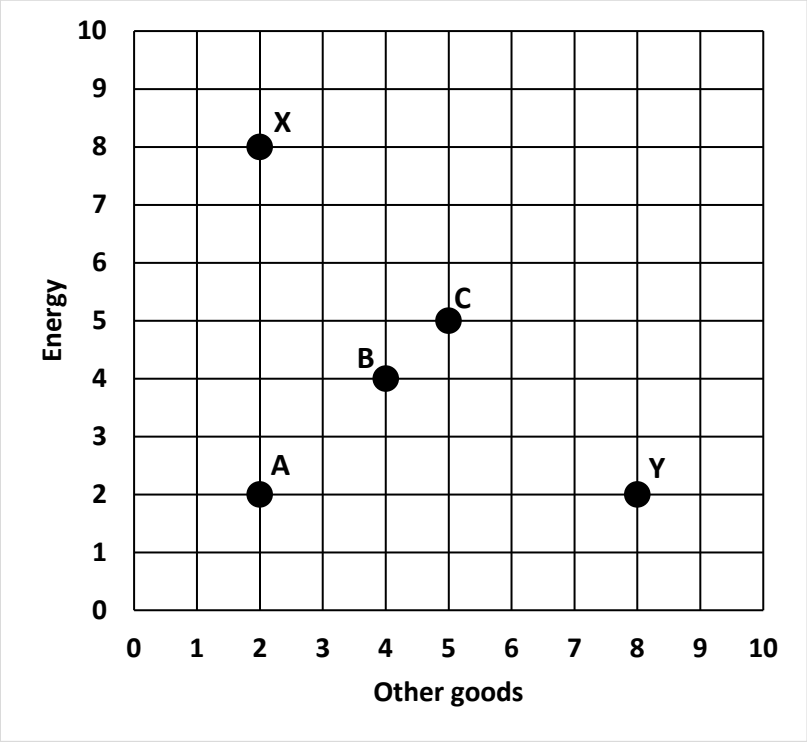


(6) The decrease in income that would exactly compensate consumers for a fall in price from $5 to $1, leaving consumers just as well off as before the price change, would be
a. $4.
b. $160.
c. $180.
d. $200.
e. none of the above.

(7) If the price falls from $5 to $1, then consumer surplus increases by
a. $4.
b. $160.
c. $180.
d. $200.
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 indifferences 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:	
b. Bundle B:	
c. Bundle C:	

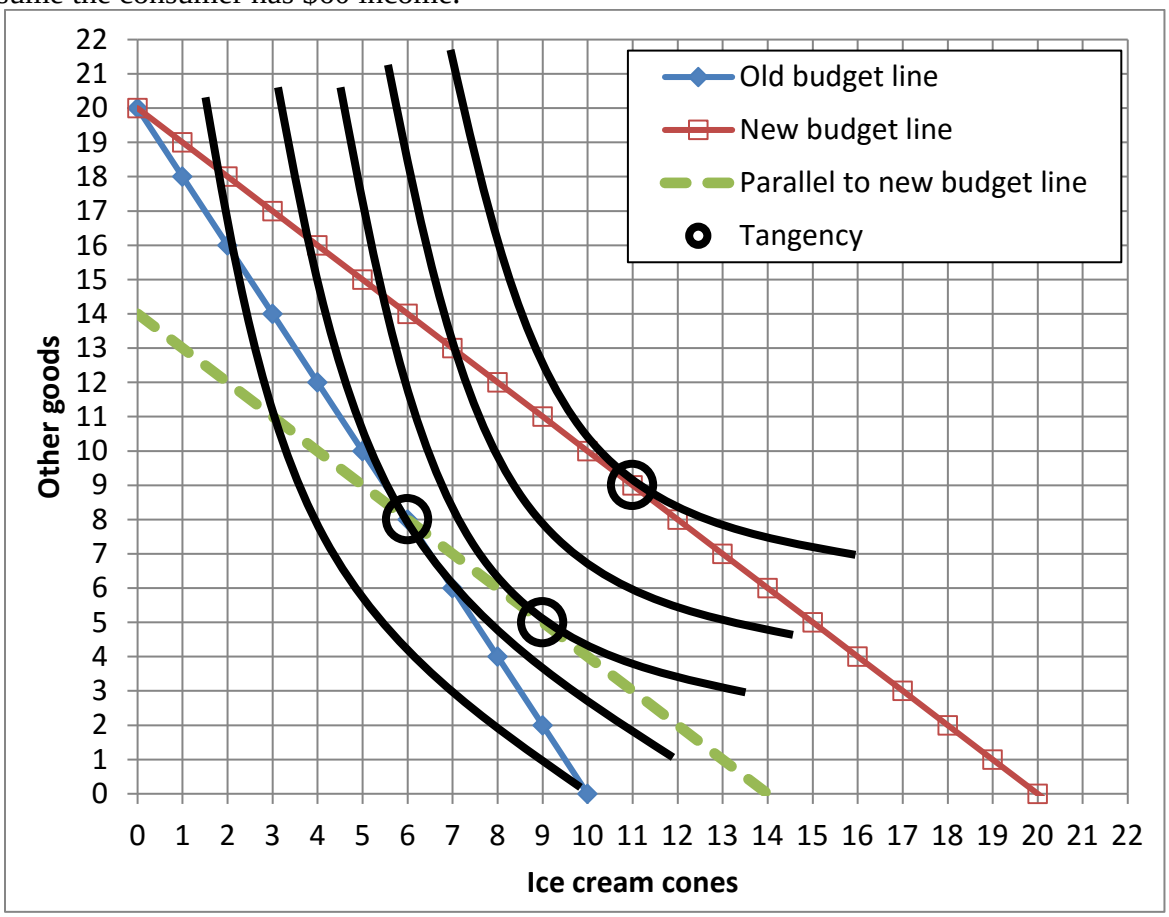
(2) [Price elasticity of demand: 10 pts] Suppose the price elasticity of demand for gasoline is –0.8, and the price of gasoline rises by 5 %.

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

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

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



a. What was the price of an ice cream cone on the old budget line?	$
b. Given the old budget line, how many ice cream cones does the consumer demand?	ice cream cones
c. What is the price of an ice cream cone on the new budget line?	$
d. Given the new budget line, how many ice cream cones does the consumer demand?	ice cream cones
e. Compute the *change* in quantity of ice cream cones demanded due to the substitution effect: Δq^{sub} .	ice cream cones
f. Compute the *change* in quantity of ice cream cones demanded due to the income effect: Δq^{inc} .	ice cream cones

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

$$\varepsilon = -S\,\eta + \varepsilon^{comp}$$

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 medical care, $\varepsilon = -0.4$, $S = 0.10$, and $\eta = 0.6$.

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

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

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

c. By about how much? %

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

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

(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	\$4	20 units	\$5	4 units
New period	\$6	15 units	\$5	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.

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

c. Give a *formula* for the Fisher cost-of-living index in the new period. The formula should include numbers but no variables.

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: $U(q_1,q_2) = (q_1-4)(q_2-5)$, 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 \$10. The consumer has \$150 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 $q_1^* = \frac{I}{5\,p_1} + \frac{2\,p_2}{p_1} + 6$, 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: $U(q_1, q_2) = q_1^2 \ q_2^3$, 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) 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:

$$q_1^* = 5\, p_1^{\varepsilon}\, p_2^{\alpha}\, I^{\eta} \ ,$$

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: $\boldsymbol{(\varepsilon + \alpha + \eta)}$? 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]