ECON 173 - Intermediate Microeconomic Analysis
Drake University, Fall 2022
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EXAMINATION #2 VERSION A
"Consumers and Demand"
September 29, 2022

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.

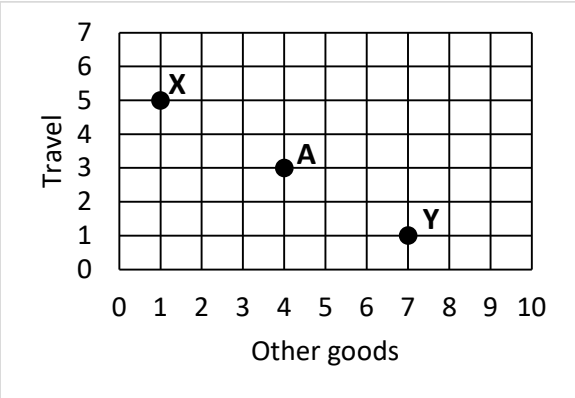
I. MULTIPLE CHOICE: Circle the one best answer to each question. Use margins for scratch work. [1 pt each—10 pts total]

(1) Which utility function below violates the axiom of *monotonicity* or *more is better*?

a. $U(q_1,q_2) = 7\, q_1\, q_2$.
b. $U(q_1,q_2) = (4q_1) / (3q_2)$.
c. $U(q_1,q_2) = -\, q_1^{-1} - q_2^{-1}$.
d. $U(q_1,q_2) = 7\, q_1^{4}\, q_2^{3}$.

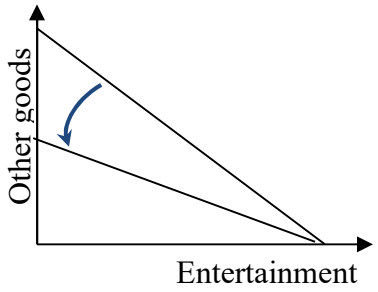
(2) Suppose in the graph below that bundles X and Y are equally preferred. Then according to the axiom of *diminishing marginal rate of substitution,* bundle A is

a. more preferred than bundles X and Y.
b. less preferred than bundles X and Y.
c. equally preferred to bundles X and Y.
d. cannot be determined.

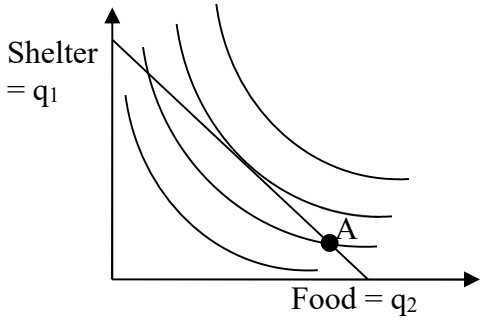


(3) In the graph below, the shift in the budget line could be caused by

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.



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
a. purchasing less food and more shelter.
b. purchasing more food and less shelter.
c. purchasing less food and less shelter.
d. any of the above.
e. none of the above.

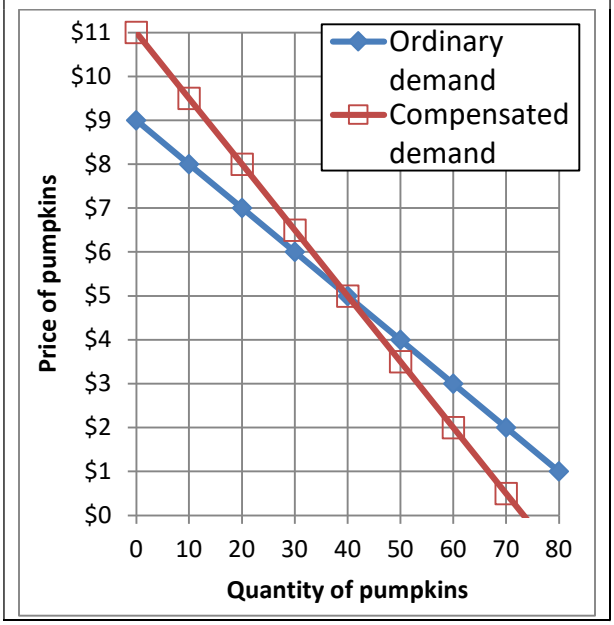
(5) Let MU_1 denote the marginal utility of shelter and MU_2 denote the marginal utility of food for this consumer. Let p_1 denote the price of shelter and p_2 denote the price of food. At bundle A,
a. $MU_2 = MU_1$ and $p_2 = p_1$.
b. $MU_2/MU_1 = p_2/p_1$.
c. $MU_2/MU_1 < p_2/p_1$.
d. $MU_2/MU_1 > p_2/p_1$.
e. cannot be determined from information given.

(6) Which of the following demand functions exhibits a constant price elasticity of demand?
a. $q_1^* = I/(5p_1) + (p_2/p_1) + 3$.
b. $q_1^* = 5\, p_1^{-2}\, I^{1.5}\, p_2^{0.5}$.
c. $q_1^* = 80 - 3\, p_1 + 0.2\, I + 0.1\, p_2$.

(7) Which price index tends to *underestimate* the rate of inflation, due to substitution bias?
a. Laspeyres price index.
b. Paasche price index.
c. Fisher price index.
d. All of the above.
e. None of the above.

(8) As one moves along an *ordinary* demand curve (sometimes called a "Marshallian" demand curve) for a particular good, the
a. price of the good is held constant.
b. the consumer's income is held constant.
c. the consumer's utility is held constant.
d. quantity demanded of the good is held constant.
e. 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 \$8. The compensating variation in income that would leave consumers just as well off as before the price change equals

a. \$3.
b. \$75.
c. \$90.
d. \$120.

(10) Again, suppose the price of pumpkins rose from \$5 to \$8. The decrease in consumer surplus equals

a. \$3.
b. \$75.
c. \$90.
d. \$120.

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

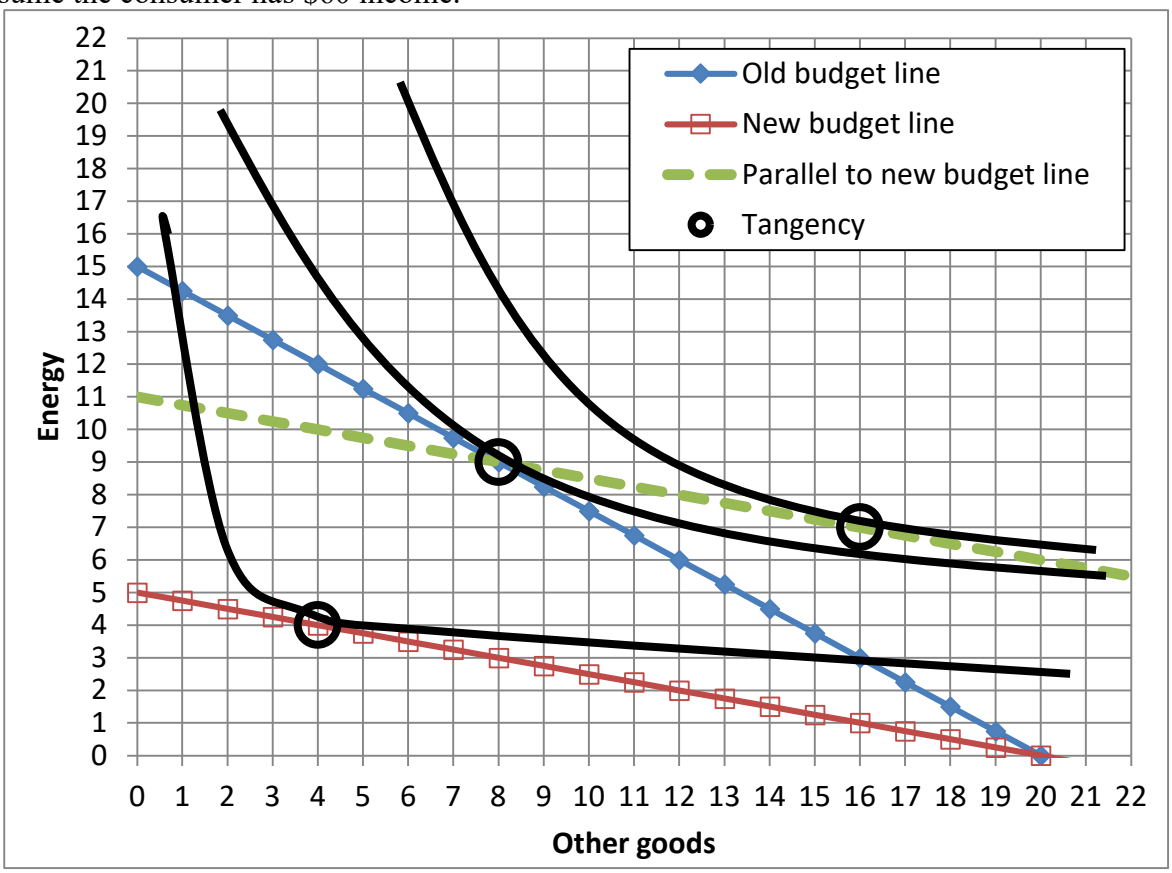
(1) [Price elasticity of demand: 10 pts] Suppose the price elasticity of demand for milk is –0.7, and the price of milk rises by 10 %.

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?	%

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

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

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



a. What was the price of energy on the old budget line?

b. Given the old budget line, how much energy does the consumer demand?

c. What is the price of energy on the new budget line?

d. Given the new budget line, how much energy does the consumer demand?

e. Compute the change in quantity of energy demanded due to the substitution effect: Δq^{sub} .

f. Compute the change in quantity of energy 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

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

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 gasoline, $\varepsilon = -0.3$, $S = 0.05$, and $\eta = 0.2$.

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

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

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

c. By about how much? %

Continue to assume that the price of gasoline 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 gasoline.

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

e. By about how much? %

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

	Health care		Other goods	
	Price	Quantity	Price	Quantity
Old period	\$2	15 units	\$5	4 units
New period	\$2	35 units	\$10	6 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: $U(q_1,q_2) = (q_1 - 4)\, q_2$, where q_1 denotes quantity of food and q_2 denotes the quantity of other goods. The price of food is \$5 and the price of other goods is \$8. 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 food—that is, the |slope| of the consumer's indifference curve with food 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 food (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 $q_1^* = \frac{I}{3\,p_1} - \frac{p_2}{p_1} + 3$, where I denotes the consumer's income, p_1 denotes the price of good #1, and p_2 denotes the price of good #2. (You may assume $(I/3) > p_2$.)

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: $U(q_1, q_2) = q_1^4 q_2$, 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 |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) 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 below.)

(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. Use the concept of consumer surplus.

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]