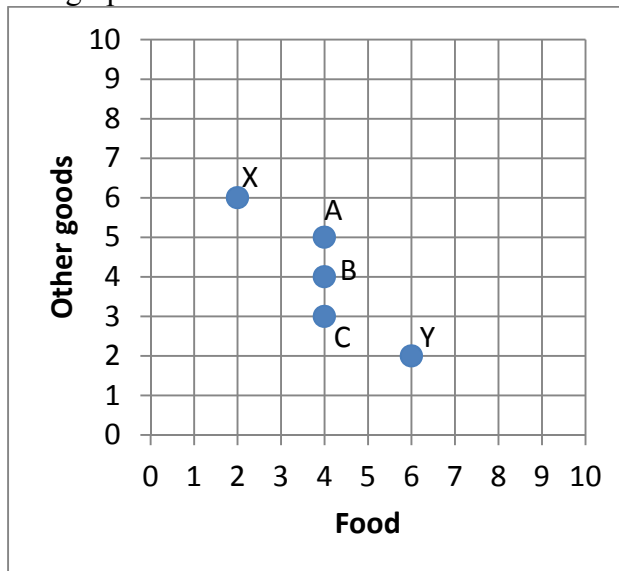


EXAMINATION #2 VERSION B
“Consumers and Demand”
September 24, 2014

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. 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:

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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 water is -0.8 , and the Water Works Department raises the price by 5 %.

- Is the demand for water *elastic* or *inelastic* ?
- Will the quantity demanded of water *increase* or *decrease*?
- By about how much?
- Will the revenue received by the Water Works Department *increase* or *decrease*?
- By about how much?

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(3) [Income elasticity of demand: 4 pts] Suppose we have the following data on consumer spending. Assume that all consumers face the same prices.

	Low-income consumers	High-income consumers
Total annual expenditures	\$30 thousand	\$50 thousand
Expenditure on restaurant meals	\$200	\$400

- Are restaurant meals an inferior good, a necessary good, or a luxury (or superior) good?
- Compute the income elasticity of demand for restaurant meals using the arc elasticity formula.

(4) [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 energy, $\epsilon = -0.9$, $S = 0.2$, and $\eta = 1.5$.

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

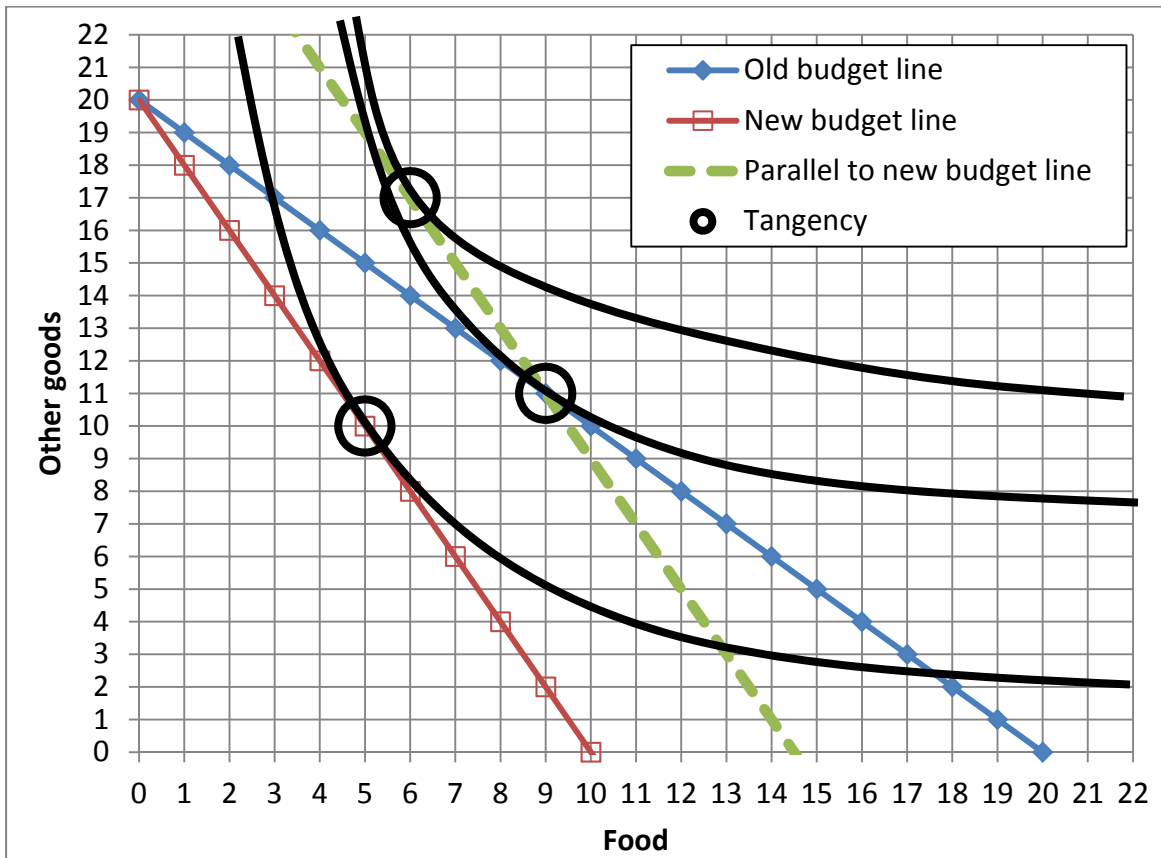
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Suppose the price of energy rises by 10%, but the consumer's income does *not* change.

- Does the quantity demanded of energy *increase* or *decrease*?
- By about how much?
- How much does the quantity demanded of energy change from the income effect alone?
- How much does the quantity demanded of energy change from the substitution effect alone?

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(5) [Substitution and income effects: 12 pts] Consider the indifference-curve diagram below. Assume the consumer has income equal to \$60. The straight lines are budget lines. The curves are consumer's indifference curves.



- What was the price of food on the old budget line?
- Given the old budget line, how much food does the consumer demand?
- What is the price of food on the new budget line?
- Given the new budget line, how much 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} .

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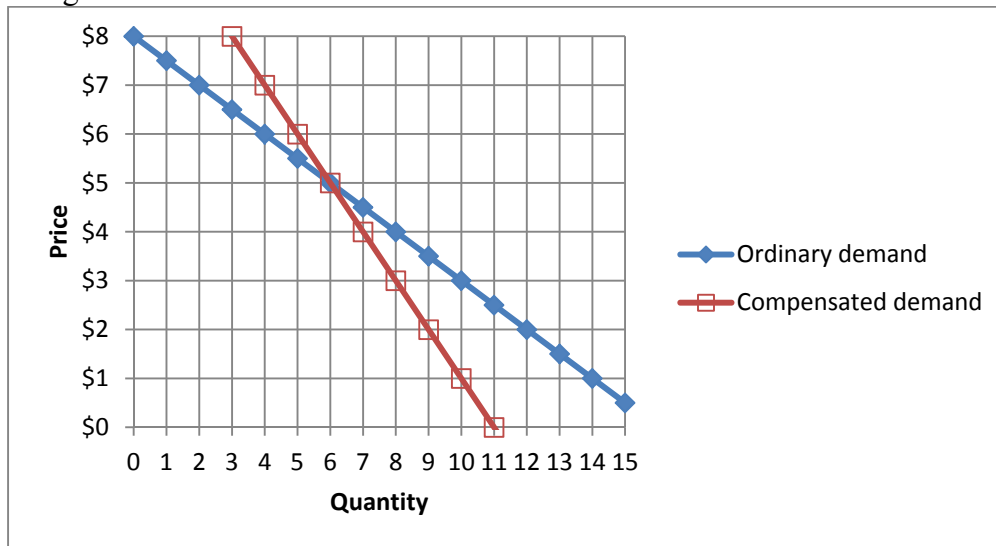
(6) [Cost-of-living indexes: 6 pts] Suppose we are given the following data on prices and quantities consumed of energy and other goods.

	Food		Other goods	
	Price	Quantity	Price	Quantity
Old period	\$5	10 units	\$10	5 units
New period	\$5	30 units	\$14	5 units

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

- Compute the Laspeyres cost-of-living index in the new period.
- Compute the Paasche cost-of-living index in the new period.
- Give a *formula* for the Fisher cost-of-living index in the new period.

(7) [Consumer welfare: 6 pts] The following graph shows the ordinary and compensated demand for a good.



Suppose the price of the good falls from \$5 to \$1.

- Are consumers *better off* or *worse off*?
- Compute the change in consumer surplus.
- Compute the compensating variation in income.

\$
\$

II. PROBLEMS: Please write your answers in the boxes on this question sheet. Show your work and circle your final answers.

(1) [Budgets and choice: 16 pts] A consumer has the following utility function:
 $U(q_1, q_2) = q_1^1 q_2^4$, where q_1 denotes the quantity of energy and q_2 denotes the quantity of other goods. The price of energy is \$4 and the price of other goods is \$5. 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 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. [8 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: 16 pts] Suppose an alleged demand function is $q_1^* = 54 I^{1.1} p_1^{-0.9} p_2^{-0.2}$.

- a. Is this function homogeneous of degree zero in income and prices? Justify your answer.

- b. Is good #1 an ordinary good or a Giffen good? Justify your answer.

- c. Is good #1 an inferior good, a necessary good, or a luxury (or superior) good? Justify your answer.

- d. Are goods #1 and #2 substitutes, complements, or unrelated in demand? Justify your answer.

(3) [Individual demand: 12 pts] A consumer has the following utility function:

$U(q_1, q_2) = q_1 (q_2 + 5)^2$, where q_1 denotes the quantity of food and q_2 denotes the quantity of other goods.

- a. [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.

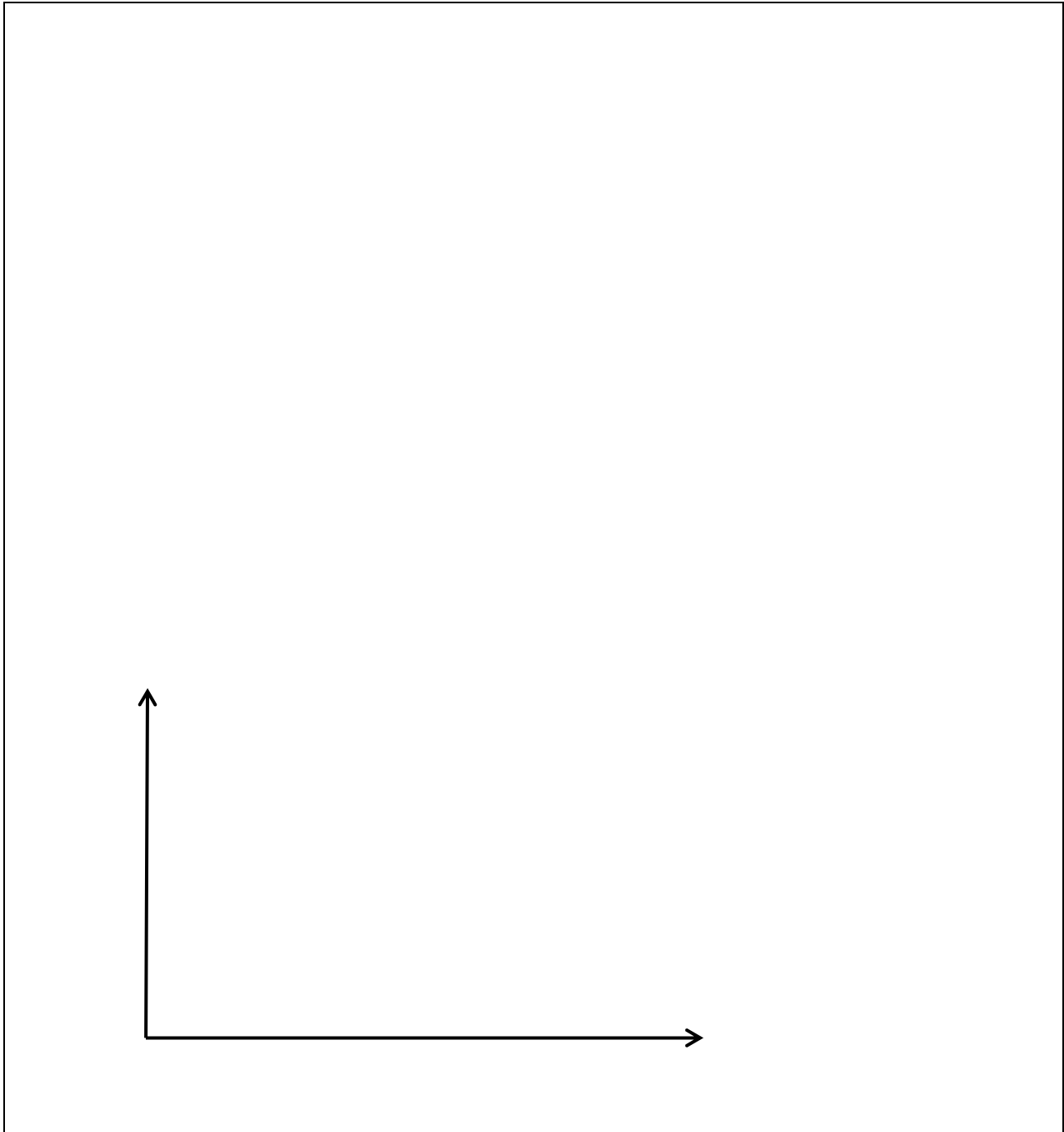
Let p_1 denote the price of food and let p_2 denote the price of other goods. Let I denote the consumer's income.

- b. [4 pts] Solve for the consumer's demand function for food—that is, the formula showing q_1^* as a function of p_1 , p_2 , and I . Show your work and circle your final answer. [Hint: check that your answer is homogeneous of degree zero.]

- c. [4 pts] 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 . Show your work and circle your final answer. [Hint: check that your answer is homogeneous of degree zero.]

III. CRITICAL THINKING: Answer the question below. [2 pts]

(1) Suppose a consumer currently buys 1000 kilowatt-hours of electricity per month at a price of \$0.10 per kilowatt-hour. Which would harm the consumer more—an increase in the price of electricity to \$0.15 per kilowatt-hour, or a decrease in income of \$50? Justify your answer with a diagram of a demand curve.



[end of exam]