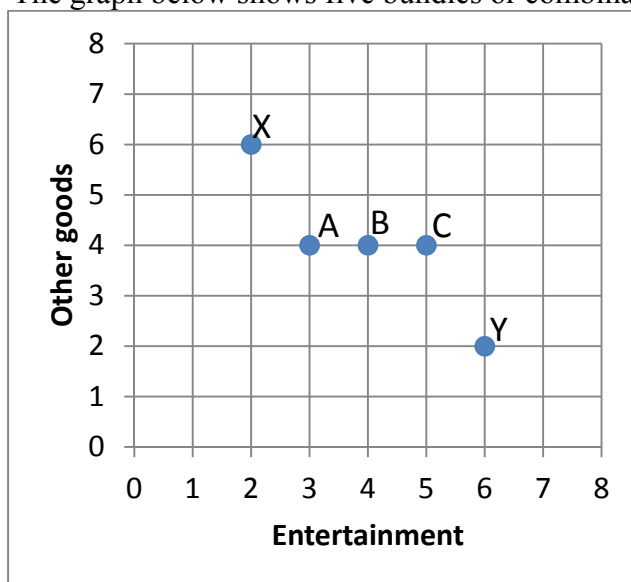


**EXAMINATION #2 VERSION A**  
**“Consumers and Demand”**  
**September 24, 2014**

**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:

b. Bundle B:

c. Bundle C:


(2) [Price elasticity of demand: 10 pts] Suppose the price elasticity of demand for Super Energy Drink is  $-1.4$ , and the company that makes the drink raises the price by 5 %.

- Is the demand for Super Energy Drink *elastic* or *inelastic* ?
- Will the quantity demanded of Super Energy Drink *increase* or *decrease*?
- By about how much?
- Will the revenue received by the company *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 cheese	\$70	\$90

- Is cheese an inferior good, a necessary good, or a luxury (or superior) good?
- Compute the income elasticity of demand for cheese 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,  $\epsilon$  denotes the own-price elasticity of demand,  $S$  denotes the share of total consumer spending devoted to the good (a fraction),  $\eta$  denotes the income elasticity of demand, and  $\epsilon^{\text{comp}}$  denotes the compensated demand elasticity. Suppose that for food,  $\epsilon = -0.4$ ,  $S = 0.2$ , and  $\eta = 0.5$ .

- Compute the compensated demand elasticity ( $\epsilon^{\text{comp}}$ ).

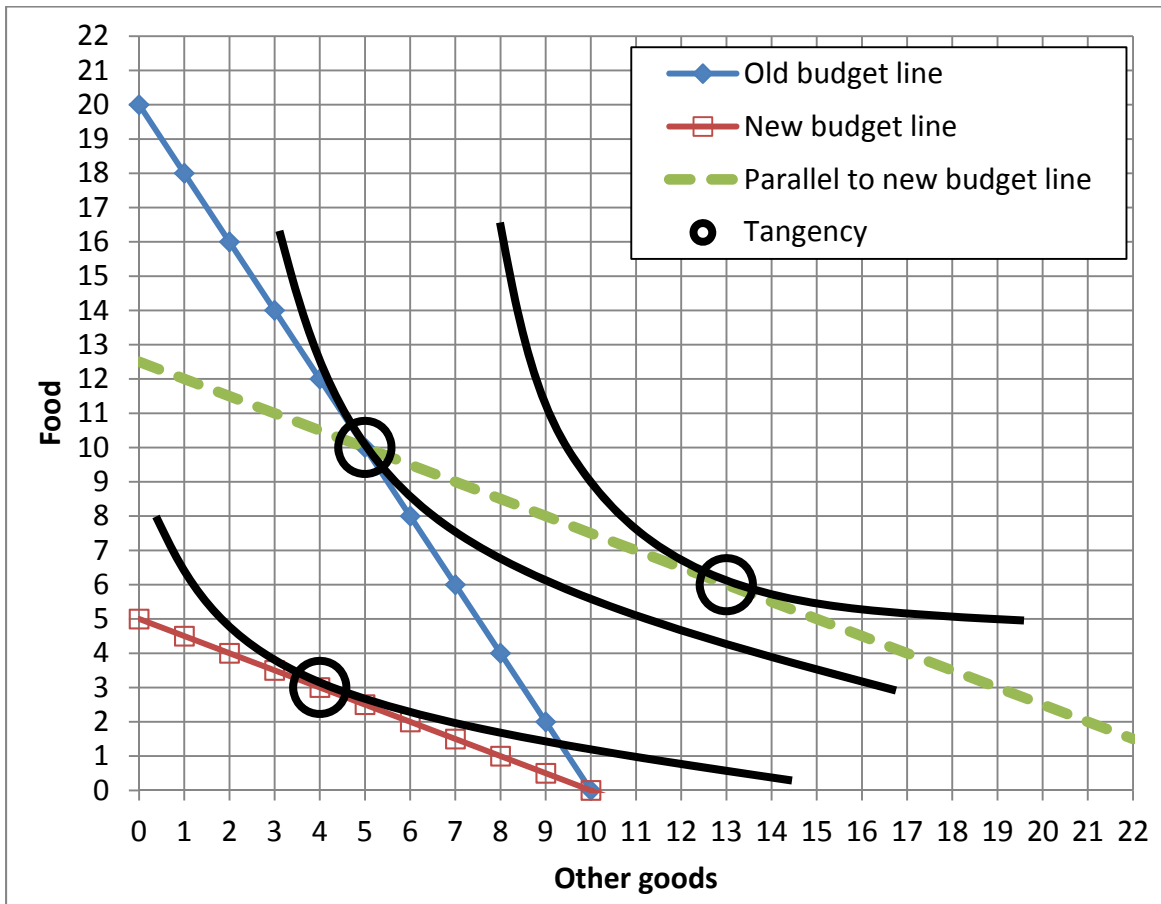
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Suppose the price of food rises by 10%, but the consumer's income does *not* change.

- Does the quantity demanded of food *increase* or *decrease*?
- By about how much?
- How much does the quantity demanded of food change from the income effect alone?
- How much does the quantity demanded of food 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:  $\Delta q^{\text{sub}}$ .
- Compute the change in quantity of food demanded due to the income effect:  $\Delta q^{\text{inc}}$ .

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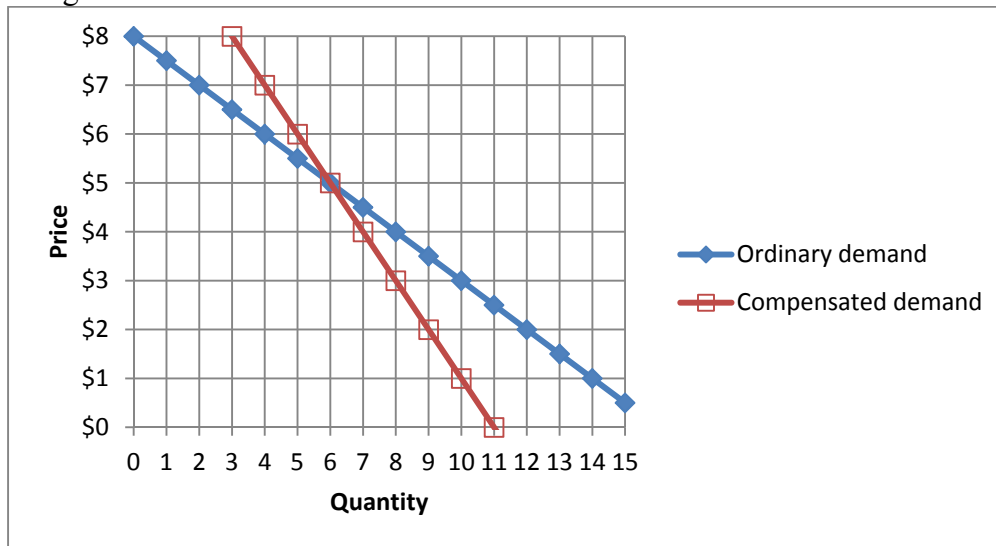
(6) [Cost-of-living indexes: 6 pts] Suppose we are given the following data on prices and quantities consumed of energy and other goods.

	Food		Other goods	
	Price	Quantity	Price	Quantity
Old period	\$3	10 units	\$10	2 units
New period	\$5	10 units	\$10	7 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 rises from \$5 to \$7.

- 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:  
 $U(q_1, q_2) = q_1^3 q_2^2$ , 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  $q_1^* = 54 I^{0.8} p_1^{-0.7} p_2^{0.1}$ .

- 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:  
 $U(q_1, q_2) = (q_1 - 3) q_2^2$ , 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.

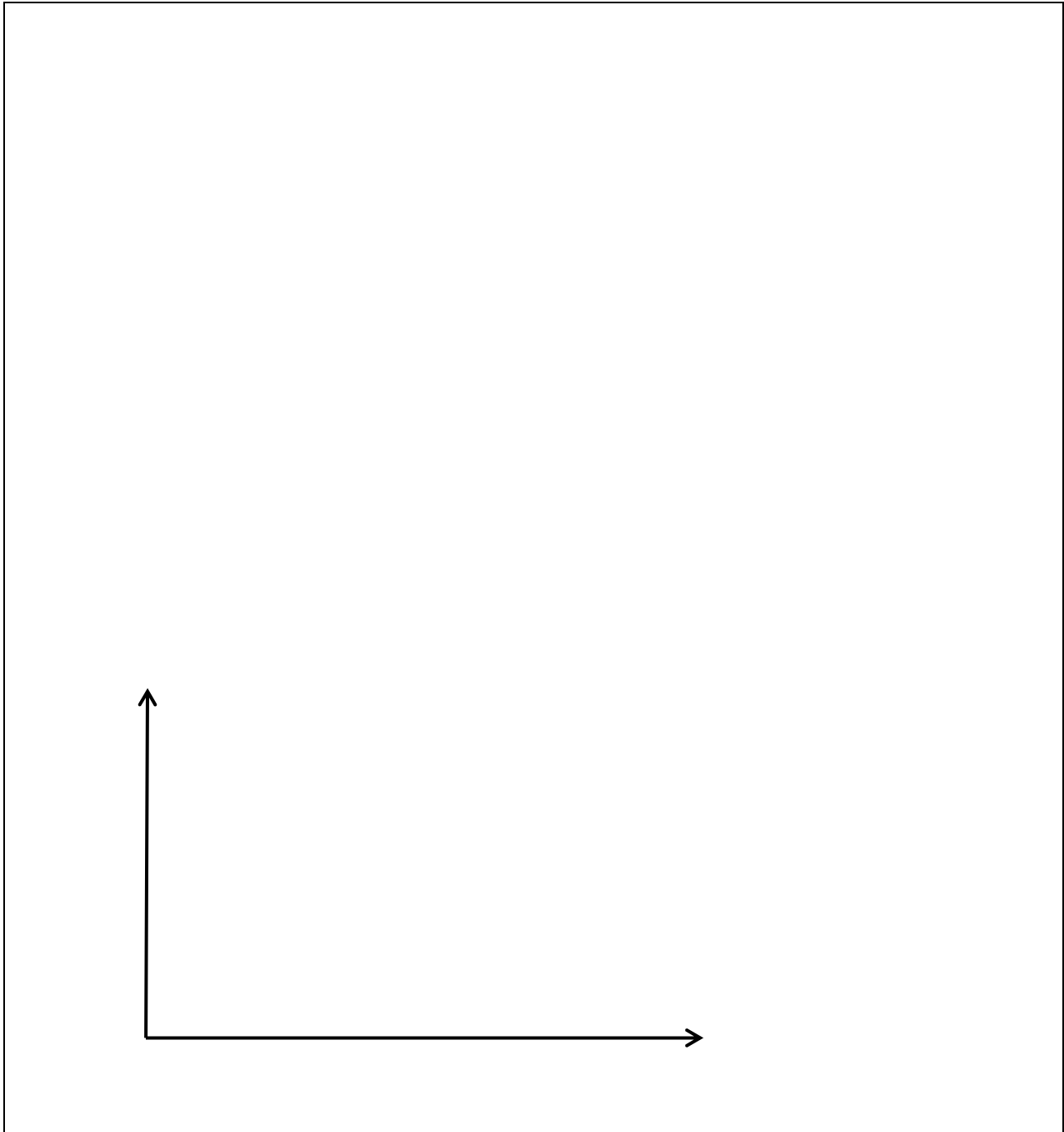
Let  $p_1$  denote the price of food and let  $p_2$  denote the price of other goods. Let  $I$  denote the consumer's income.

- 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 benefit the consumer more—a decrease in the price of electricity to \$0.05 per kilowatt-hour, or an increase in income of \$50? Justify your answer with a diagram of a demand curve.



[end of exam]