

EXAMINATION #2 VERSION B
“Consumers and Demand”
October 3, 2011

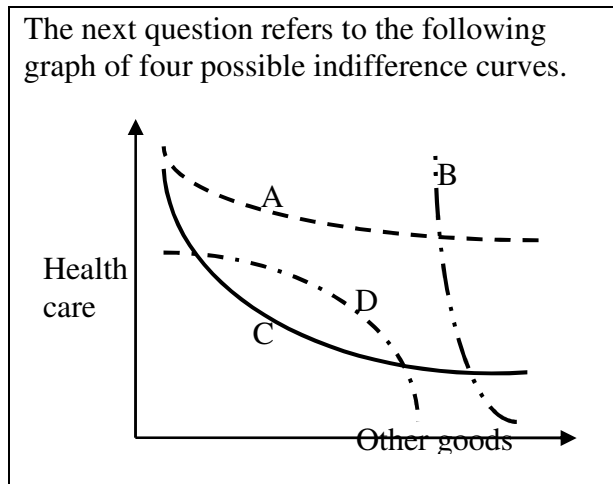
INSTRUCTIONS: This exam is closed-book, closed-notes, and calculators are NOT permitted. Point values for each question are noted in brackets.

I. MULTIPLE CHOICE: Circle the one best answer to each question. Feel free to use margins for scratch work [2 pts each—10 pts total]

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

- a. $U(q_1, q_2) = 4q_1 (3 - q_2)$.
- b. $U(q_1, q_2) = -4q_1^{-1/2} - 3q_2^{-1/2}$.
- c. $U(q_1, q_2) = 4q_1^{1/2} + 3q_2^{1/2}$.
- d. $U(q_1, q_2) = (-4/q_1) + (-3/q_2)$.
- e. $U(q_1, q_2) = q_1^4 q_2^3$.

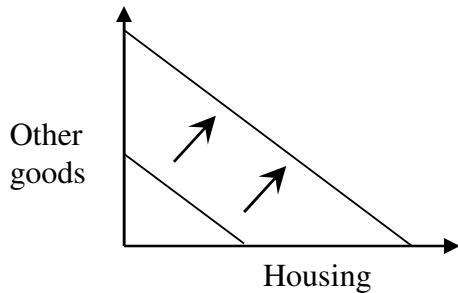
The next question refers to the following graph of four possible indifference curves.



(2) Which indifference curve above violates the assumption of diminishing marginal rate of substitution?

- a. Curve A.
- b. Curve B.
- c. Curve C.
- d. Curve D.
- e. All of the above.
- f. None of the above.

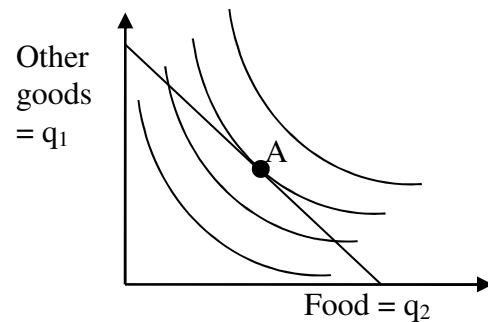
The next question refers to the following graph of a budget line.



(3) In the graph above, 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 housing.
- d. a decrease in the price of housing.
- 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 other goods.
- b. purchasing more food and fewer other goods.
- c. purchasing less food and fewer other goods.
- d. any of the above.
- e. 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,

- 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.

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 electricity is -0.4 , and the electric company lowers the price of electricity by 5 %.

- a. Is the demand for electricity *elastic* or *inelastic* ?
- b. Will the quantity demanded of electricity *increase* or *decrease*?
- c. By about how much?
- d. Will the revenue received by the electric company *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 food is 0.25 .

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

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(3) [Slutsky equation: 10 pts] Suppose Aaron buys a bundle of consumer goods including 20 hamburgers per month. The partial derivative of Aaron's demand for hamburgers with respect to the price of hamburgers ($\partial q^*/\partial p$) is -3 . The price of hamburgers is \$2.

- a. Compute Aaron's price elasticity of demand for hamburgers.

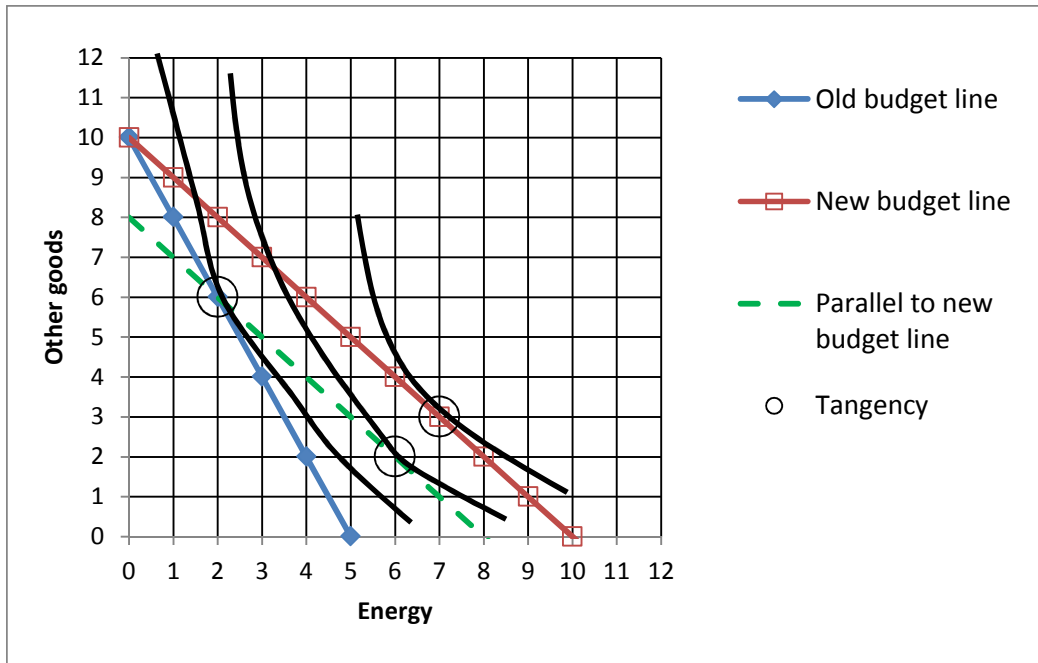
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Now suppose the price of hamburgers rises from \$2 to \$4. Thus $\Delta p = +2$.

- b. Compute the approximate *total* decrease in hamburgers demanded due to the price increase (Δq^{total}).
- c. How much would Aaron 's income have to increase so that Aaron could still just afford the old bundle?
- d. Assume that the partial derivative of Aaron 's demand for hamburgers with respect to his income ($\partial q^*/\partial I$) is 0.025. Compute the approximate decrease in hamburgers demanded due to the *income effect* alone (Δq^{inc}).
- e. Compute the approximate decrease in hamburgers demanded due to the *substitution effect* alone (Δq^{sub}).

hamburgers
\$
hamburgers
hamburgers

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



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

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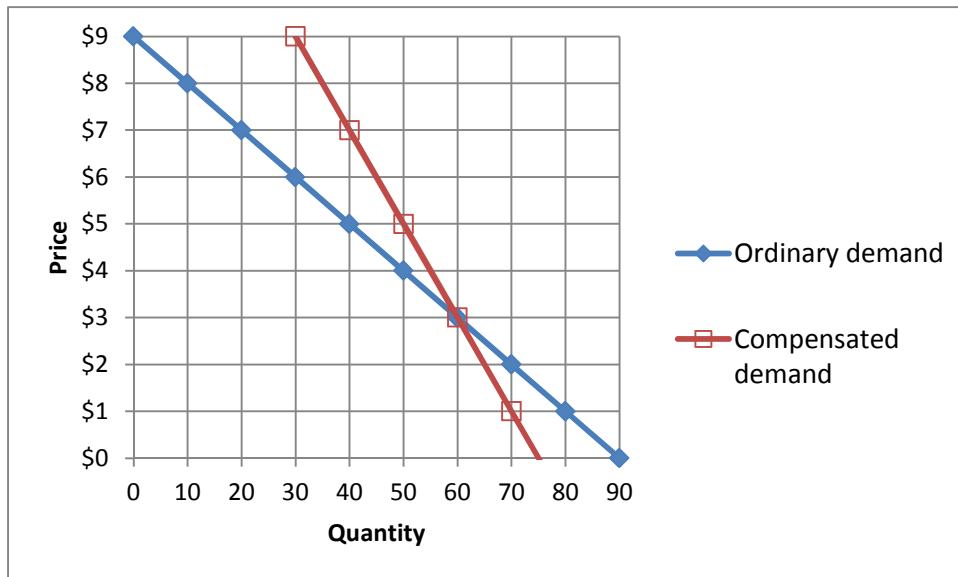
(5) [Cost-of-living indexes: 6 pts] Suppose we are given the following data on prices and quantities consumed of food and other goods.

	Food		Other goods	
	Price	Quantity	Price	Quantity
Old period	\$3	3 units	\$4	4 units
New period	\$3	10 units	\$5	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.

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



Suppose the price of milk rises from \$3 to \$7.

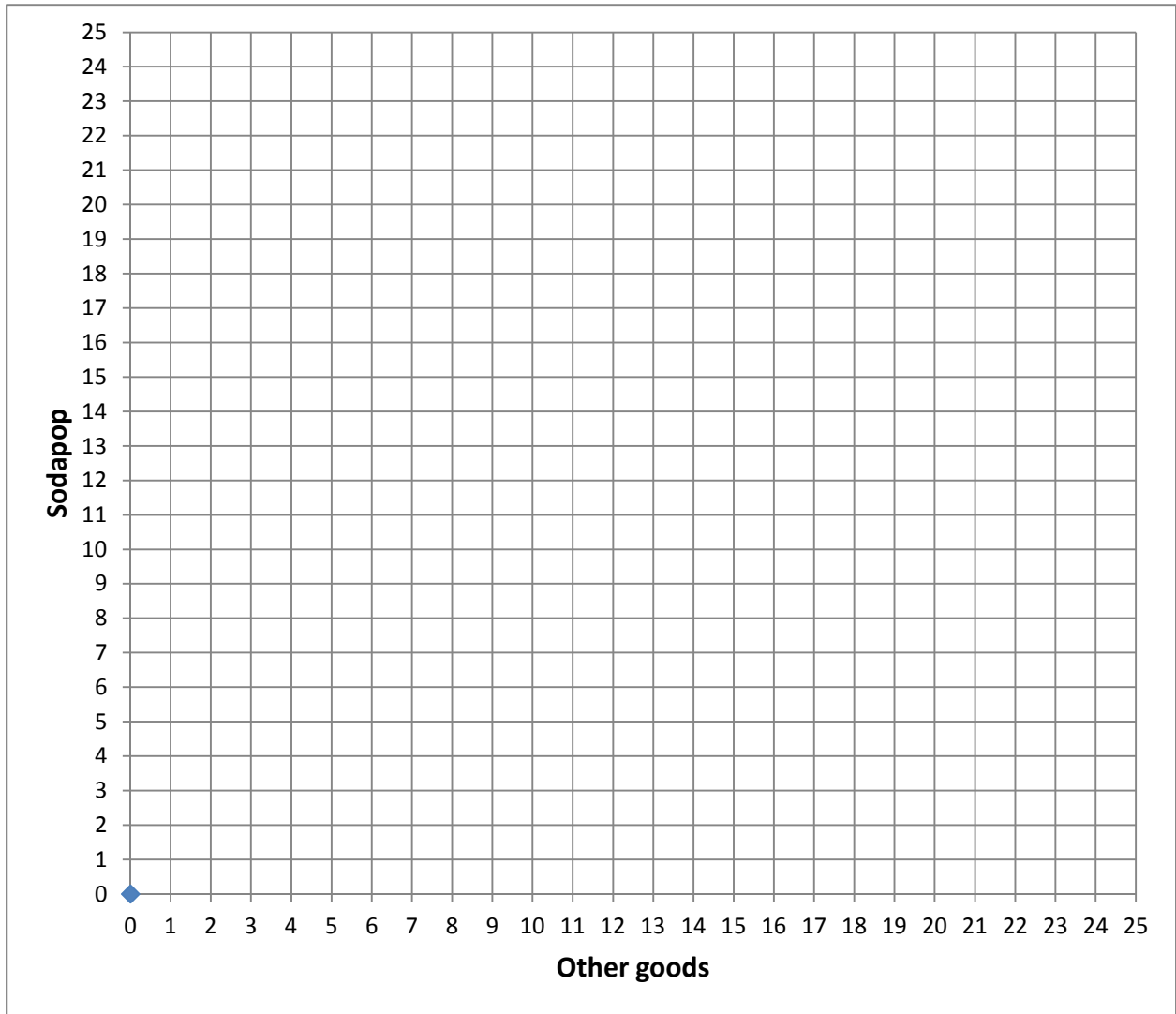
- Are consumers *better off* or *worse off*?
- Compute the change in consumer surplus.
- Compute the compensating variation in income.

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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) [Budget constraint: 6 pts] Suppose the price of sodapop is \$2 and the price of other goods is \$3. Suppose a consumer has \$30 to spend on these two goods.

- a. [2 pts] Compute the slope of the budget line with sodapop on the vertical axis and other goods on the horizontal axis.
- b. [4 pts] Graph the budget line below.



(2) [Budgets and choice: 12 pts] A consumer has the following utility function:
 $U(q_1, q_2) = q_1 q_2^2$, where q_1 denotes the quantity of energy and q_2 denotes the quantity of other goods. The price of energy is \$2 and the price of other goods is \$8. The consumer has \$300 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 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. [4 pts] Solve for the quantities of energy (q_1^*) and other goods (q_2^*) that this consumer will choose. Circle your final answers.

(3) [Individual demand: 9 pts] A consumer has the following utility function:

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

- a. [3 pts] Find a formula for the consumer's marginal rate of substitution 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. [3 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. [3 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.]

(4) [Individual demand and elasticity: 6 pts] Consider the following alleged individual demand function:

$$q_1^* = 3 p_1^{-0.9} p_2^{-0.2} I^{1.1} .$$

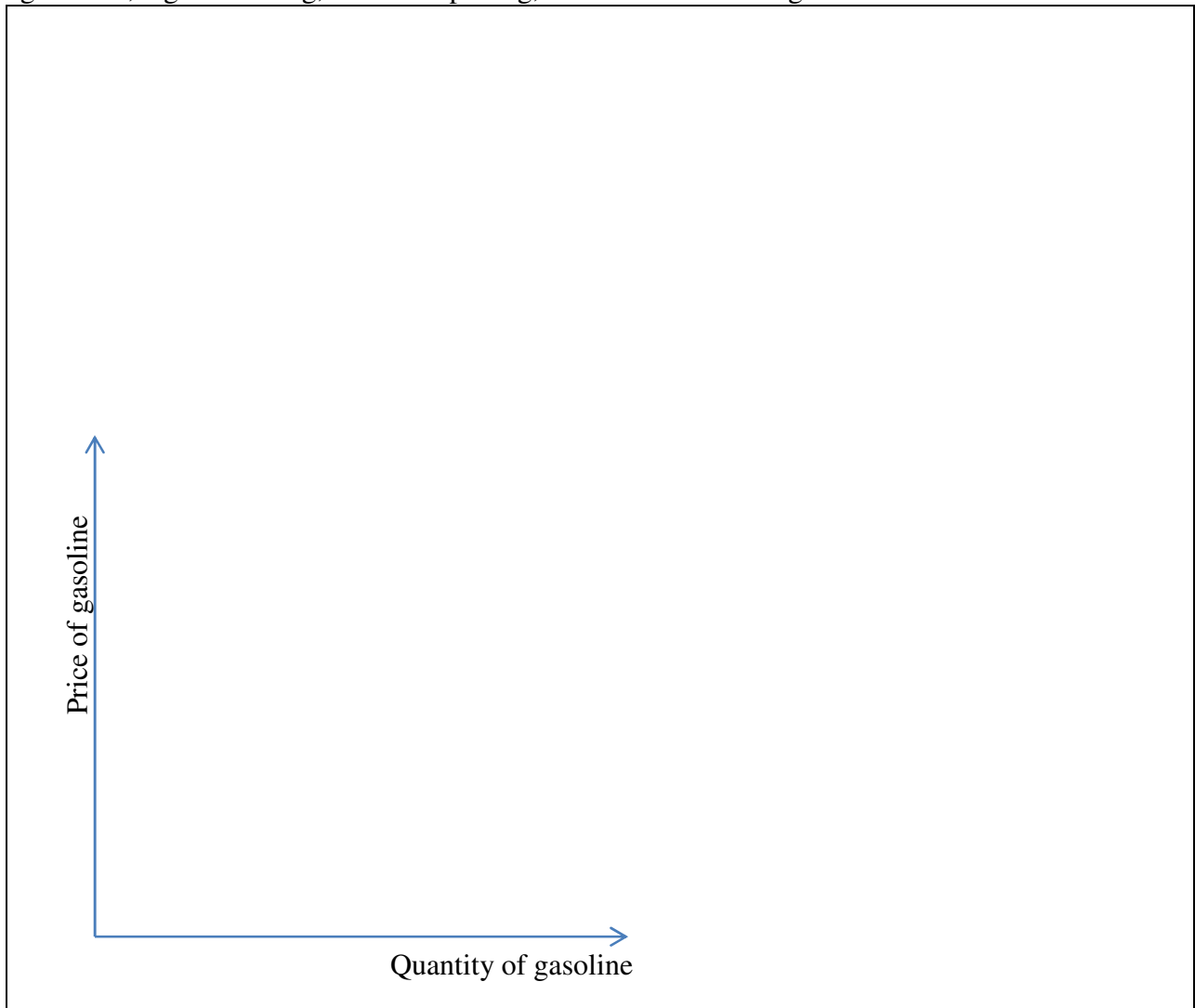
- a. [3 pts] Find the own-price elasticity of demand for this function. Justify your answer either from the definition of elasticity, or from a rule of thumb. Circle your final answer.

- b. [3 pts] Determine if the function is homogeneous of degree zero in income and prices. Show your work. Then answer “yes” or “no.”

IV. CRITICAL THINKING: Answer just *one* of the questions below (your choice). [3 pts]

- (1) Suppose the price of gasoline is \$3.50 per gallon and Anna buys 20 gallons per month. Which would Anna prefer: an increase of \$0.50 in the price of gasoline, or a decrease of \$10 in her monthly income? Justify your answer with a demand curve diagram.
- (2) Suppose Brian buys only burgers (q_b) and fries (q_f). Suppose Brian doubles his purchases of both burgers and fries from the old period to the new period. That is,
$$2 q_b^{\text{old}} = q_b^{\text{new}} \quad \text{and} \quad 2 q_f^{\text{old}} = q_f^{\text{new}} .$$
Which increases faster—Brian's *Laspeyres* cost-of-living index, his *Paasche* cost-of-living index, or his *Fisher* cost-of-living index? Justify your answer with an algebraic proof. (Do not use the diagram below.)

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]