

EXAMINATION #2 VERSION B
“Consumers and Demand”
October 8, 2012

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—14 pts total]

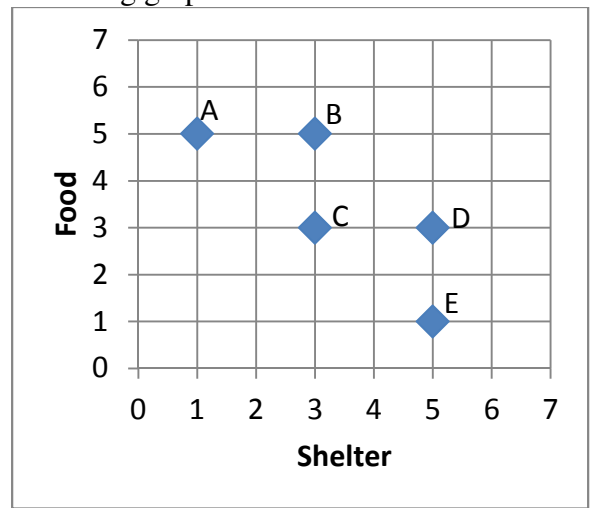
(1) The assumption of monotonicity implies that indifference curves

- a. get flatter as they approach the horizontal axis.
- b. get steeper as they approach the horizontal axis.
- c. slope up.
- d. slope down.
- e. none of the above.

(2) According to the assumption of "monotonicity" or "more is better," which bundle *must* be preferred by any consumer to bundle C?

- a. Bundle A only.
- b. Bundle B only.
- c. Bundle D only.
- d. Bundle E only.
- e. Bundles B and D.
- f. All of the above.
- g. None of the above.

The next two questions refer to the following graph of consumer bundles.



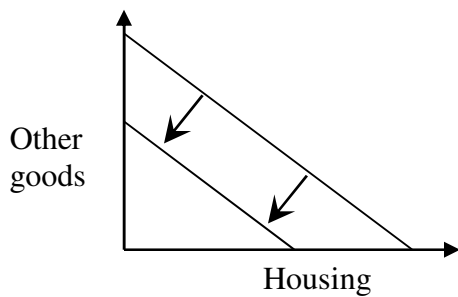
(3) Suppose that bundles A and E are equally preferred. According to the assumption of "diminishing marginal rate of substitution," bundle C must be

- a. less preferred than bundles A or E.
- b. less preferred than bundles B or D.
- c. equally preferred to bundles A or E.
- d. equally preferred to bundle B or D.
- e. more preferred than bundles A or E.
- f. more preferred than bundles B or D.

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

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

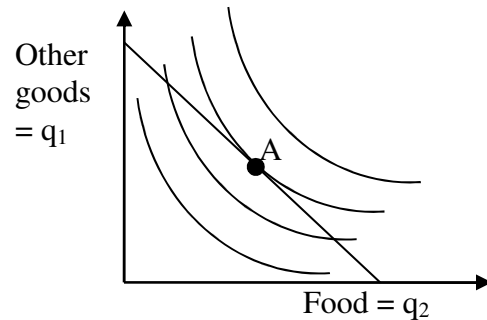
The next question refers to the following graph of a budget line.



(5) 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.



(6) 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.

(7) 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) [Individual demand: 8 pts] Consider the following alleged individual demand function:

$$q_1^* = 20 p_1^{-1.2} p_2^{-0.2} I^{0.9} .$$

- a. What is the own-price elasticity of demand?
- b. What is the income elasticity of demand?
- c. Are good #1 and good #2 *substitutes, complements, or neither?*
- d. Is this function homogeneous of degree zero in all prices and income? Answer YES or NO.

(2) [Price elasticity of demand: 10 pts] Suppose the price elasticity of demand for cable TV service equals -1.5 .

- a. Is the demand for cable TV service *elastic* or *inelastic* ?

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Suppose the cable TV company raises the price of cable TV service by 4 %.

- b. Will the quantity demanded of cable TV service *increase* or *decrease*?
- c. By about how much?
- d. Will the revenue received by the cable TV company *increase* or *decrease*?
- e. By about how much?

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(3) [Income elasticity of demand: 10 pts] Suppose the income elasticity of demand for peanut butter equals 0.75 .

- a. Is peanut butter is an *inferior* good, a *necessary* good, or a *luxury or superior* good?

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Suppose that consumers' income rises by 4%.

- b. Will the quantity demanded of peanut butter *increase* or *decrease*?
- c. By about how much?
- d. Will the share of the consumer's budget devoted to peanut butter *increase* or *decrease*?
- e. By about how much?

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(4) [Slutsky equation: 10 pts] Suppose Zack buys a bundle of consumer goods including 25 pizzas per year. The partial derivative of Zack's demand for pizzas with respect to the price of pizzas ($\partial q^*/\partial p$) equals -3 . The price of pizzas is \$7.

- a. Compute Zack's price elasticity of demand for pizzas.

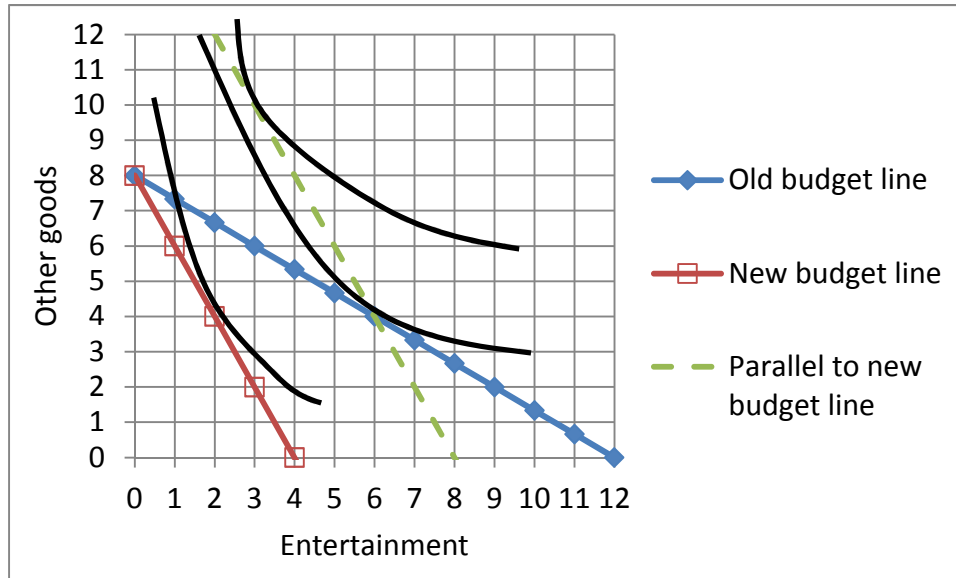
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Now suppose the price of pizzas rises from \$7 to \$9. Thus $\Delta p = +2$.

- b. Compute the approximate *total* decrease in pizzas demanded due to the price increase (Δq^{total}).
- c. How much would Zack 's income have to increase so that Zack could still just afford his old bundle, including 25 pizzas?
- d. Assume that the partial derivative of Zack 's demand for pizzas with respect to his income ($\partial q^*/\partial I$) is 0.02. Compute the approximate decrease in pizzas demanded due to the *income effect* alone (Δq^{inc}).
- e. Compute the approximate decrease in pizzas demanded due to the *substitution effect* alone (Δq^{sub}).

pizzas
\$
pizzas
pizzas

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



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

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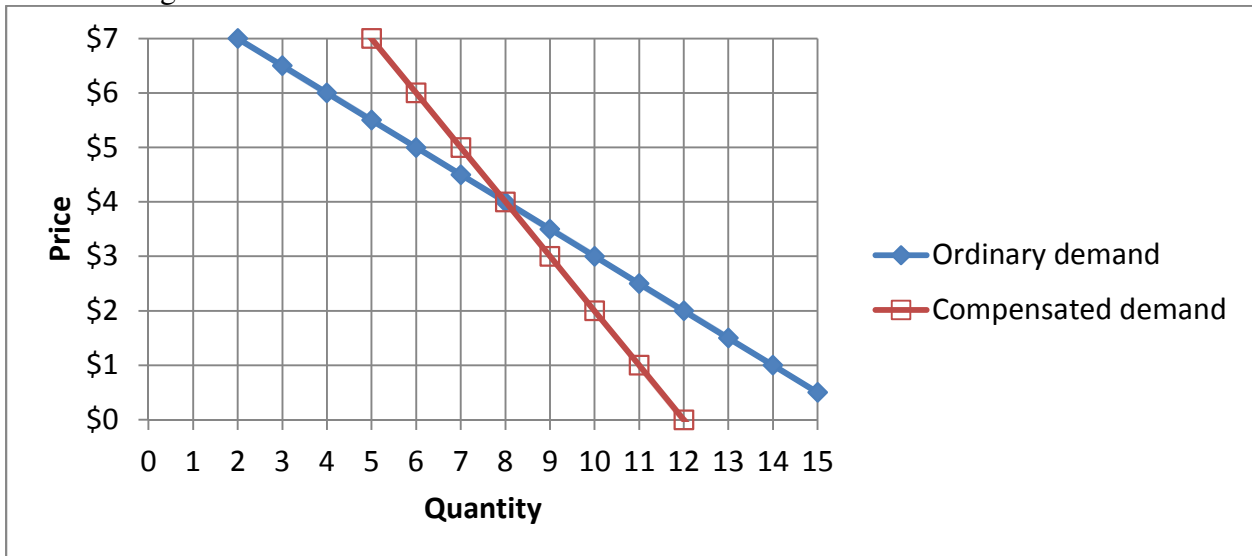
(6) [Cost-of-living indexes: 6 pts] Suppose we are given the following data on prices and quantities consumed of food and other goods.

	Energy		Other goods	
	Price	Quantity	Price	Quantity
Old period	\$5	6 units	\$4	5 units
New period	\$5	8 units	\$7	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. (Do not compute its value.)

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



Suppose the price of gasoline falls from \$4 to \$2.

- a. Are consumers *better off* or *worse off*?
- b. Compute the change in consumer surplus.
- c. 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) [Budgets and choice: 12 pts] Alan has the following utility function: $U(q_1, q_2) = q_1^4 q_2^2$, where q_1 denotes the quantity of donuts and q_2 denotes the quantity of coffee. The price of donuts is \$5 and the price of coffee is \$2. Alan has \$120 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 Alan's marginal rate of substitution of coffee for donuts—that is, the slope of Alan's indifference curve with donuts on the vertical axis and coffee 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 donuts (q_1^*) and coffee (q_2^*) that Alan will choose. Circle your final answers.

(2) [Individual demand: 9 pts] Brianna has the following utility function:

$U(q_1, q_2) = q_1^2 (q_2 - 2)$, where q_1 denotes the quantity of ebooks and q_2 denotes the quantity of protein bars.

- a. [3 pts] Find a formula for Brianna's marginal rate of substitution of protein bars for ebooks—that is, the slope of Brianna's indifference curve with ebooks on the vertical axis and protein bars 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 ebooks and let p_2 denote the price of protein bars. Let I denote Brianna's income.

- b. [3 pts] Solve for Brianna's demand function for ebooks—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 Brianna's demand function for protein bars—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.]

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

(1) Carla's utility function is $U = q_1 q_2$, where q_1 denotes the quantity of food and q_2 denotes the quantity of shelter. Suppose the price of food is $p_1 = \$4$ and the price of shelter is $p_2 = \$5$. Compute the *minimum* amount of income that Carla must have to attain a target utility of $U = 500$ utils. Show your work and circle your final answer.

(2) Suppose Derek buys only sandwiches (q_s) and Gatorade (q_g). Suppose the prices of both items increase by 50% from the old period to the new period. That is,

$$p_s^{\text{new}} = 1.5 p_s^{\text{old}} \quad \text{and} \quad p_g^{\text{new}} = 1.5 p_g^{\text{old}}.$$

However, we do not know what quantities Derek chooses in either period. Which increases fastest—Derek'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.

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]