

EXAMINATION #2 ANSWER KEY “Consumers and Demand”

Version A

I. Multiple choice

- (1) b. (2) d. (3) b. (4) d. (5) d. (6) c.

II. Short answer

- (1) a. less preferred. b. less preferred. c. more preferred.
d. more preferred. e. cannot be determined.
- (2) a. inelastic. b. decrease. c. 3%.
d. increase. e. 2%.
- (3) Note: This graph is based on Hal Varian’s presentation of income and substitution effects in his intermediate microeconomics textbooks. Other textbooks offer different graphical presentations.
a. \$3. b. 12 units. c. \$6.
d. 4 units. e. -6 units. f. -2 units.
- (4) a. Laspeyres = 140. b. Paasche = 120. c. $\sqrt{140 \times 120}$.

III. Problems

- (1) [Budgets and choice]
a. Equation for budget line: $10 q_1 + 5 q_2 = 90$.
b. $MRS = MU_2/MU_1 = q_1 / (2(q_2+3))$.
c. Solve $MRS = p_2/p_1 = 5/10$ jointly with equation for budget line to get $q_1^* = 7$, $q_2^* = 4$.
- (2) [Properties of individual demand functions]
a. Check homogeneity of the demand function:
$$47 (a I)^{0.9} (a p_1)^{-0.8} (a p_2)^{-0.1} = (a^{0.9} a^{-0.8} a^{-0.1}) (47 I^{0.9} p_1^{-0.8} p_2^{-0.1})$$
$$= 1 \times 47 I^{0.9} p_1^{-0.8} p_2^{-0.1} = 47 I^{0.9} p_1^{-0.8} p_2^{-0.1} .$$

Note that the “a” factor cancels. So multiplying income and prices by some positive factor *does not* change the quantity demanded. The function is homogeneous of degree zero in income and prices.
b. Must determine sign of partial derivative with respect to own price (or equivalently, sign of own-price elasticity of demand). Here, it is probably easier to find the own-price elasticity = -0.8, which is negative. Since it is negative, this is an ordinary good, not a Giffen good.
c. Must determine sign of partial derivative with respect to income (or equivalently, sign of income elasticity of demand). Here, it is probably easier to find the income elasticity = 0.9, which is positive. Since it is positive, this is normal good, not an inferior good.
d. Must determine sign of partial derivative with respect to cross price (or equivalently, sign of cross-price elasticity of demand). Here, it is probably easier to find the cross-

price elasticity = -0.1, which is negative. Since it is negative, the goods are complements, not substitutes.

(3) [Finding individual demand functions]

a. $MRS = MU_2/MU_1 = 2 q_1 / (3q_2)$.

Solve $MRS = p_2/p_1$ jointly with $I = p_1q_1 + p_2q_2$ to get

b. $q_1^* = \frac{3I}{5 p_1}$, and c. $q_2^* = \frac{2I}{5 p_2}$.

(4) [Slutsky equation]

a. $\% \Delta q^{tot} = \varepsilon \times 5\% = -1.5\%$, Quantity demanded decreases by 1.5%.

b. $\varepsilon^{comp} = \varepsilon + S\eta = -0.3 + 0.2(0.2) = -0.26$.

$\% \Delta q^{sub} = \varepsilon^{comp} \times 5\% = -1.3\%$, Quantity demanded decreases by 1.3%.

III. Critical thinking

(1) The least-cost bundle will be at a tangency between the target indifference curve and the lowest budget line that touches this indifference curve. The tangency condition is $MRS = p_2/p_1$ or $q_1/q_2 = 2/6$. The equation for the target indifference curve is $75 = q_1q_2$. Solve these equations jointly to get $q_1^* = 5$ and $q_2^* = 15$. This bundle will cost $5(\$6) + 15(\$2) = \$60$. So Amy must have a minimum of \$60 in income to reach a target utility of $U=75$ utils.

(2) Since the spending share rises as income rises, the good must be a luxury (or superior) good.

To compute the income elasticity of demand, recall that $\% \text{ chg } S = \% \text{ chg } Q - \% \text{ chg } I$. We are given that $\% \text{ chg } I = 5\%$ and $\% \text{ chg } S = 2\%$. Substituting and solving gives $\% \text{ chg } Q = 7\%$. So the income elasticity of demand = $\% \text{ chg } Q / \% \text{ chg } I = 7/5$ or 1.4.

Version B

I. Multiple choice

(1) d. (2) b. (3) a. (4) c. (5) b. (6) c.

II. Short answer

(1) a. more preferred. b. more preferred. c. less preferred.

d. cannot be determined. e. less preferred.

(2) a. elastic. b. increase. c. 6%.

d. increase. e. 1%.

(3) Note: This graph is based on Hal Varian's presentation of income and substitution effects in his intermediate microeconomics textbooks. Other textbooks offer different graphical presentations.

a. \$10. b. 4 units. c. \$4.

d. 9 units. e. 4 units. f. 1 unit.

(4) a. Laspeyres = 160. b. Paasche = 130. c. $\sqrt{160 \times 130}$.

III. Problems

(1) [Budgets and choice]

a. Equation for budget line: $4 q_1 + 2 q_2 = 70$.

- b. $MRS = MU_2/MU_1 = 3(q_1-5) / (2q_2)$.
c. Solve $MRS = p_2/p_1 = 2/4$ jointly with equation for budget line to get $q_1^* = 10$, $q_2^* = 15$.
- (2) [Properties of individual demand functions]
- a. Check homogeneity of the demand function:
$$\frac{(aI)}{5(a p_1)} + \frac{(a p_2)}{(a p_1)} + 3 = \frac{I}{5p_1} + \frac{p_2}{p_1} + 3 .$$
Note that the “a” factor cancels. So multiplying income and prices by some positive factor a *does not* change the quantity demanded. The function is homogeneous of degree zero in income and prices.
- b. Must determine sign of partial derivative with respect to own price (or equivalently, sign of own-price elasticity of demand). Here, it is probably easier to find the partial derivative $= \frac{-I}{5 p_1^2} - \frac{p_2}{10 p_1^2}$, which is negative. Since it is negative, this is an ordinary good, not a Giffen good.
- c. Must determine sign of partial derivative with respect to income (or equivalently, sign of income elasticity of demand). Here, it is probably easier to find the partial derivative $= \frac{I}{5 p_1}$, which is positive. Since it is positive, this is normal good, not an inferior good.
- d. Must determine sign of partial derivative with respect to cross price (or equivalently, sign of cross-price elasticity of demand). Here, it is probably easier to find the partial derivative $= \frac{1}{10 p_1}$, which is positive. Since it is positive, the goods are substitutes, not complements.
- (3) [Finding individual demand functions]
- a. $MRS = MU_2/MU_1 = 3 q_1 / (4q_2)$.
Solve $MRS = p_2/p_1$ jointly with $I = p_1q_1 + p_2q_2$ to get
- b. $q_1^* = \frac{4I}{7 p_1}$, and c. $q_2^* = \frac{3I}{7 p_2}$.
- (4) [Slutsky equation]
- a. $\% \Delta q^{tot} = \varepsilon \times 5\% = -1\%$. Quantity demanded decreases by 1%.
b. $\varepsilon^{comp} = \varepsilon + S\eta = -0.2 + 0.4(0.3) = -0.08$.
 $\% \Delta q^{sub} = \varepsilon^{comp} \times 5\% = -0.4\%$. Quantity demanded decreases by 0.4%.

III. Critical thinking

Same as Version A.

[end of answer key]