ECON 173 - Intermediate Microeconomic Analysis
Drake University, Fall 2015
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EXAMINATION #2 ANSWER KEY
"Consumers and Demand"

Version A

I. Multiple choice

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

II. Short answer

(1) a. 30 lattes. b. 20 units other goods. c. -3/2 = -1.5.
(2) a. elastic. b. decrease. c. 6%. d. decrease. 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. 10 units. c. $10.
d. 4 units. e. -4 units. f. -2 units.
(4) a. Laspeyres = 160. b. Paasche = 130. c. $\sqrt{160 \times 130} \approx 145$.
(5) a. better off from price decrease.
b. change in consumer surplus = area between horizontal lines at $4 and $2, vertical axis, and ordinary demand curve = $18.
c. compensating variation in income = area between horizontal lines at $4 and $2, vertical axis, and compensated demand curve = $16.

III. Problems

(1) a. Equation for budget line: $4\ q_1 + 2\ q_2 = 50$.
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 $q_1^* = 8$, $q_2^* = 9$.
(2) a. Check homogeneity of the demand function:
$\frac{(a\, I) + 8\, (a\, p_2)}{4\, (a\, p_1)} + 5 = \frac{a\, (I+8p_2)}{a\, (4\, p_1)} + 5 = \frac{(I+8p_2)}{(4\, p_1)} + 5$. Note that the "a" factor cancels. So multiplying income and prices by some factor *does not* change the quantity demanded. The function <u>is homogeneous of degree zero</u> in income and prices.
b. $\frac{\partial q_1*}{\partial p_1} = -\frac{I + 8p_2}{4\ p_1^2} < 0$, so price and quantity demanded are negatively related and this is an <u>ordinary good</u>.
c. $\frac{\partial q_1*}{\partial I} = \frac{1}{4\, p_1} > 0$, so income and quantity demanded are positively related and this is a <u>normal good</u>.
d. $\frac{\partial q_1*}{\partial p_2} = \frac{2}{p_1} > 0$, so the price of the other good and the quantity demanded are positively related and the two goods are <u>substitutes</u>.

(3) a. MRS = $MU_2/MU_1 = 2\,q_1 / q_2$. Solve MRS = p_2/p_1 jointly with $I = p_1q_1 + p_2q_2$ to get
b. $q_1^* = \frac{I}{3p_1}$, and c. $q_2^* = \frac{2I}{3p_2}$.

(4) a. $\%\Delta q^{tot} = \varepsilon \times 10\% = -9\%$, Quantity demanded decreases by 9%.
b. $\varepsilon^{comp} = \varepsilon + S\eta = -0.9 + 0.1(0.6) = -0.84.$
$\%\Delta q^{sub} = \varepsilon^{comp} \times 10\% = -8.4\%$, Quantity demanded decreases by 8.4%.

III. Critical thinking

(1) All three of Adam's COL indices increase at exactly the *same rate*.
Justification with algebraic proof:
Adam's Laspeyres COL index

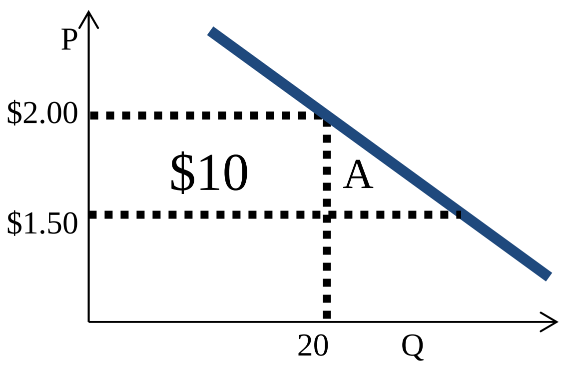
$$= \frac{p_s^{new}q_s^{old} + p_g^{new}q_g^{old}}{p_s^{old}q_s^{old} + p_g^{old}q_g^{old}} \times 100 = \frac{1.2p_s^{old}q_s^{old} + 1.2p_g^{old}q_g^{old}}{p_s^{old}q_s^{old} + p_g^{old}q_g^{old}} \times 100 = 1.2 \times 100 = 120 .$$

Adam's Paasche COL index

$$= \frac{p_s^{new}q_s^{new} + p_g^{new}q_g^{new}}{p_s^{old}q_s^{new} + p_g^{old}q_g^{new}} \times 100 = \frac{1.2p_s^{old}q_s^{new} + 12p_g^{old}q_g^{new}}{p_s^{old}q_s^{new} + p_g^{old}q_g^{new}} \times 100 = 1.2 \times 100 = 120 .$$

Adam's Fisher COL index $= \sqrt{Laspeyres \times Paasche} = \sqrt{120 \times 120} = 120$.

(2) The gain in consumer surplus from the decrease in price equals 0.50×20 = \$10 plus the area of triangle A. Thus the gain in consumer surplus is greater than \$10. Therefore the decrease in the bus fare would benefit Brianna more than a \$10 increase in income.



Version B

I. Multiple choice

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

II. Short answer

(1) a. 15 lattes. b. 30 units other goods. c. -2/4 = -0.5.
(2) a. inelastic. b. increase. c. 4%.
d. decrease. 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. \$2. b. 10 units. c. \$6.
d. 2 units. e. -6 units. f. -2 units.

(4) a. Laspeyres = 130. b. Paasche = 120. c. $\sqrt{130 \times 120} \approx 125$.

(5) a. worse off from price increase.
b. change in consumer surplus = area between horizontal lines at \$4 and \$6, vertical axis, and ordinary demand curve = \$10.
c. compensating variation in income = area between horizontal lines at \$4 and \$6, vertical axis, and compensated demand curve = \$12.

III. Problems

(1) a. Equation for budget line: $10\ q_1 + 5\ q_2 = 150$.
b. MRS = $MU_2/MU_1 = 2\ (q_1-5) / (3q_2)$.
c. Solve MRS = $p_2/p_1 = 5/10$ jointly with equation for budget line to get $q_1^* = 11$, $q_2^* = 8$.

(2) a. Check homogeneity of the demand function:
$\frac{(a\,I)-(a\,p_1)}{5\,(a\,p_1)} + 7 = \frac{a\,(I-p_2)}{a\,(5\,p_1)} + 7 = \frac{(I-p_2)}{(5\,p_1)} + 7$. Note that the "a" factor cancels. So multiplying income and prices by some factor *does not* change the quantity demanded. The function is homogeneous of degree zero in income and prices.
b. $\frac{\partial q_1*}{\partial p_1} = -\frac{I-p_2}{5\ p_1^2} < 0$, so price and quantity demanded are negatively related and this is an ordinary good.
c. $\frac{\partial q_1*}{\partial I} = \frac{1}{5\,p_1} > 0$, so income and quantity demanded are positively related and this is a normal good.
d. $\frac{\partial q_1*}{\partial p_2} = \frac{-1}{5p_1} < 0$, so the price of the other good and the quantity demanded are negatively related and the two goods are complements.

(3) a. MRS = $MU_2/MU_1 = q_1 / (4\ q_2)$.
Solve MRS = p_2/p_1 jointly with $I = p_1q_1 + p_2q_2$ to get
b. $q_1^* = \frac{4I}{5p_1}$, and c. $q_2^* = \frac{I}{5p_2}$.

(4) a. $\%\Delta q^{tot} = \varepsilon \times 10\% = -8\%$, Quantity demanded decreases by 8%.
b. $\varepsilon^{comp} = \varepsilon + S\eta = -0.8 + 0.05(0.4) = -0.78$.
$\%\Delta q^{sub} = \varepsilon^{comp} \times 10\% = -7.8\%$, Quantity demanded decreases by 7.8%.

III. Critical thinking

Same as Version A.

Version C

I. Multiple choice

(1) d. (2) f. (3) a. (4) a. (5) a. (6) a.

II. Short answer

(1) a. 12 lattes. b. 10 units other goods. c. -6/5 = -1.2.

(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. $10. b. 3 units. c. $3.
d. 12 units. e. +6 units. f. +3 units.

(4) a. Laspeyres = 116. b. Paasche = 110. c. $\sqrt{116 \times 110} \approx 113$.

(5) a. better off from price decrease.
b. change in consumer surplus = area between horizontal lines at $6 and $2, vertical axis, and ordinary demand curve = $36.
c. compensating variation in income = area between horizontal lines at $6 and $2, vertical axis, and compensated demand curve = $28.

III. Problems

(1) a. Equation for budget line: $4\ q_1 + 3\ q_2 = 85$.
b. $MRS = MU_2/MU_1 = 3\ q_1 / (2(q_2-5))$.
c. Solve $MRS = p_2/p_1 = 2/4$ jointly with equation for budget line to get $q_1^* = 15$, $q_2^* = 10$.

(2) a. Check homogeneity of the demand function:
$$\frac{(a\,I) + 2\,(a\,p_1)}{3\,(a\,p_2)} + 5 = \frac{a\,(I + 2p_1)}{a\,(3\,p_2)} + 5 = \frac{(I + 2p_1)}{(3\,p_2)} + 5 \ .$$
Note that the "a" factor cancels. So multiplying income and prices by some factor *does not* change the quantity demanded. The function <u>is homogeneous of degree zero</u> in income and prices.
b. $\frac{\partial q_1*}{\partial p_1} = -\frac{I + 2p_2}{3\ p_1^2} < 0$, so price and quantity demanded are negatively related and this is an <u>ordinary good</u>.
c. $\frac{\partial q_1*}{\partial I} = \frac{1}{3\,p_1} > 0$, so income and quantity demanded are positively related and this is a <u>normal good</u>.
d. $\frac{\partial q_1*}{\partial p_2} = \frac{2}{3p_1} > 0$, so the price of the other good and the quantity demanded are positively related and the two goods are <u>substitutes</u>.

(3) 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) a. $\%\Delta q^{tot} = \varepsilon \times 10\% = -7\%$, Quantity demanded decreases by 7%.
b. $\varepsilon^{comp} = \varepsilon + S\eta = -0.7 + 0.2(0.8) = -0.54$.
$\%\Delta q^{sub} = \varepsilon^{comp} \times 10\% = -5.4\%$, Quantity demanded decreases by 5.4%.

III. Critical thinking

Same as Version A.

[end of answer key]