

ANSWERS: Homework #2
Due: 6-25-07
APEC 3001
Applied Microeconomics:
Consumers, Producers, and Markets
(Summer 2007)
Instructor: Hurley

Please show all the work you do to solve a problem.

1. What is an indifference curve?

Answer: An indifference curve is a set of bundles among which the consumer is indifferent or equally satisfied.

2. What does it mean to say an individual's preferences satisfy the property of completeness?

Answer: For any two bundles, say (i) and (ii), the individual knows that a bundle (i) is more satisfying than (ii), less satisfying than (ii), or as equally satisfying as (ii). The completeness property is violated when an individual responds with "I don't know."

3. What is the price consumption curve and what does it tell us?

Answer: Holding income and the prices of other goods constant, the price consumption curve for a good is the set of optimal bundles as the price of the good varies. It tells us an individual's demand for the good whose price is changing.

4. What is the difference between a normal and inferior good?

Answer: For a normal good, consumption increases with an increase in income when prices are held constant. For an inferior good, consumption decreases with an increase in income when prices are held constant.

5. If an individual's preferences satisfy the properties of (i) completeness, (ii) more is better, (iii) transitivity, and (iv) convexity, which of the following statements is false?
- Indifference curves are ubiquitous.
 - Indifference curves are downward sloping.
 - Indifference curve cannot cross.
 - Indifference curves become steeper as we move down and to the right. They bow away from the origin or are concave to the origin.

Answer: d. Completeness means a. must be true. More is better means b. must be true. More is better and transitivity means c. must be true. Convexity means indifference curves become less steep as we move down and to the right. They bow toward the origin or are convex to the origin. So, d. must be false.

6. Suppose an individual's marginal rate of substitution is $MRS = MU_H/MU_F = 3F/H$ where F is the pounds of food and H is square feet of housing per month. Income is \$1,600 a month, the price of food (P_F) is \$10 a pound, and the price of housing (P_H) is \$60 per square foot. Which of the following statements must be true about the consumption bundle consisting of $F = 70$ and $H = 15$?
- The individual can increase satisfaction by consuming more housing and less food.
 - The individual can increase satisfaction by consuming more food and less housing.
 - The individual can afford to consume more food and more housing.
 - This is the individual's best feasible consumption bundle.

Answer a. To solve this problem we need to check two things: (i) that the individual is on his budget constraint and (ii) that $MRS = P_H/P_F$. Let's start with (i). Expenditures on food are $\$10 \times 70 = \700 . Expenditures on housing are $\$60 \times 15 = \900 . So total expenditures are \$1,600, which just exhausts the individual's income. But does the individual have the right mix of goods? $MRS = 3 \times 70 / 15 = 14$. $P_H/P_F = 60/10 = 6$. Since $MRS > P_H/P_F$, we know that the individual is not consuming the best feasible bundle. So how can the individual improve? $MRS > P_H/P_F$ implies $MU_H/P_H > MU_F/P_F$ or that the individual is getting more satisfaction from the last dollar spent on housing. Therefore, the individual should consume more housing. Since the individual is on the budget constraint, the only way to consume more housing is to consume less food.

7. Consider the demand $Q_D = 5,000 - 2M - 25P$ where M is monthly income. What is the income elasticity of demand if $M = \$1,500$ and $P = 50$?
- 1/4.
 - 1/4.
 - 4.
 - 4.

Answer: c. The income elasticity of demand is $e = \frac{\Delta Q_D}{\Delta M} \frac{M}{Q_D}$. $\Delta Q_D / \Delta M = -2$ and $Q_D = 5,000 - 2 \times 1,500 - 25 \times 50 = 750$, so $e = -2 \times 1,500 / 750 = -4$.

8. Consider the demand $Q_X = 8,000 - 20P_Z - 50P_X$ where Q_X is the quantity of good X, P_Z is the price of good Z, and P_X is the price of good X. Suppose $P_X = 80$ and $P_Z = 100$, which of the following statements must be true?
- Good Z is a substitute for good X.
 - Good Z is a complement for good X.
 - Good X is normal.
 - Good X is inferior.

Answer: b. To answer questions regarding substitutes and complements, we need the cross-price elasticity of demand, which means we must know the relationship between the prices of the goods of interest and the quantity demanded. We have this information above, so we cannot rule out a. or b. To answer questions regarding normal and inferior goods, we need the income elasticity of demand, which means we must know the relationship between income and the quantity demanded of the good of interest. We do not have this information above, so we can rule out c. and d. The cross-price elasticity of demand is $h_{xz} = \frac{\Delta Q_X}{\Delta P_Z} \frac{P_Z}{Q_X}$.

$\Delta Q_X / \Delta P_Z = -20$ and $Q_D = 8,000 - 20 \times 100 - 50 \times 80 = 2,000$, so $e = -20 \times 100 / 2,000 = -1$. Goods are substitutes if the cross-price elasticity of demand is positive. They are complements if the cross-price elasticity of demand is negative.

9. Tyler's demand for ice cream is $Q_T = 12 - 3P$, while Mason's is $Q_M = 6 - P$.
- Find the market demand for ice cream if Tyler and Mason are the only two consumers in the market.
 - What is the price elasticity of demand when $P = 2$?
 - At this price, is demand elastic, unit elastic, or inelastic?
 - If this price were to increase by a little bit, what would happen to the total revenues from ice cream sales?

Answer:

- First note that $Q_T = 0$ when $P = 4$ and $Q_M = 0$ when $P = 6$. Therefore, for $P > 6$, $Q_D = 0 + 0 = 0$. For $6 \geq P > 4$, $Q_D = Q_M = 6 - P$. For $P \leq 6$, $Q_D = Q_T + Q_M = 12 - 3P + 6 - P = 18 - 4P$.
- The price elasticity of demand is $\eta = \frac{\Delta Q_D}{\Delta P} \frac{P}{Q_D}$. For $P = 2$, $Q_D = 18 - 4P$, so $\Delta Q_D / \Delta P = -4$ and $Q_D = 10$. Therefore, $\eta = -4 \times 2 / 10 = -4/5$.
- Demand for ice cream is inelastic.
- Since demand is inelastic, a small increase in price will increase total revenue from the sale of ice cream. If demand were unit elastic, increasing the price would have no effect on total revenue. If it were elastic, increasing the price would decrease total revenue.

- 10 The figure below illustrates the best feasible bundle of firecrackers and bottle rockets (F_0 for firecrackers and R_0 for bottle rockets) given current income (M_0) and prices (P_{F0} for firecrackers and P_{R0} for bottle rockets).
- Illustrate how an increase in the price of bottle rockets changes the best feasible bundle of firecrackers and bottle rockets?
 - Illustrate the substitution and income effects?
 - Given the way you have drawn your figure, are bottle rockets a normal or inferior good?
 - Could an increase in the price of bottle rockets ever increase the demand for bottle rockets? Explain.

Answer:

- An increase in the price of bottle rockets rotates the budget constraint inwards (see B_1 on the figure below) such that the new best feasible bundle is F_1 and R_1 .
- To find the income and substitution effect, we need to shift the new budget constraint back to the original indifference curve (I_0). The substitution effect is then $R' - R_0 < 0$, while the income effect is $R_1 - R' < 0$.
- Since an increase in the price of bottle rockets decreases our purchasing power and the income effect is negative, bottle rockets are a normal good given the way the figure is drawn.
- Yes, an increase in the price of bottle rockets could possibly increase the demand for bottle rockets. For this to happen, bottle rockets would have to be an inferior good and the income effect would have to be larger in magnitude than the substitution effect. When this occurs, a good is called a Giffen good.

