

Assignment #2Due Friday 9/22/06 by 6 p.m. in the Econ 301-1 slot in the Economics Alcove

Please show the calculations used to arrive at your answers. Draw graphs neatly and label axes and points clearly. In general, leave numbers in fractional form while solving problems. Round final answers to the first decimal place if necessary.

- A. (1) Suppose that Sara's income is \$60 per month and she has to decide how to split her income between beer (B) and pizza (Z). Beer costs \$3 a six-pack ( $P_B$ ) and pizza costs \$2 a slice ( $P_Z$ ).
- Write down an equation for Sara's budget constraint.
  - What is the most beer she can purchase? What is the most pizza she can purchase?
  - Graph Sara's budget constraint. What is the slope of the budget constraint?
- (2) Assume Sara's utility can be represented as  $U(B,Z) = B^3Z^2$ , where B = the six-packs of beer she consumes, and Z = the slices of pizza she consumes.
- What is Sara's marginal utility of beer? What is Sara's marginal utility of pizza?
  - What is Sara's marginal rate of substitution (MRS)?
- (3) a. Given Sara's budget and preferences, how much beer and pizza will she consume?  
b. Demonstrate that  $\frac{MU_B}{P_B} = \frac{MU_Z}{P_Z}$  is satisfied when Sara consumes this bundle.
- (4) Sara gets a raise, so her income is now \$90 a month.
- Show her new budget constraint on the same graph. Now how much beer will she consume? How much pizza?
  - What is the ratio of expenditure on pizza to expenditure on beer?
  - What is the relationship between this ratio and her utility function?
- B. Throughout this problem, assume that Ralph has the same utility function as Sara had in Problem A.
- (1) Ralph's income is \$120 a month, which he completely spends on 30 six-packs of beer and 60 slices of pizza.
- What is the price of beer? What is the price of pizza?
  - Graph Ralph's budget constraint and mark his consumption bundle on the constraint. What is his utility at this consumption bundle?
- (2) Now suppose a quantity tax is placed on beer in the amount of \$0.60 per six-pack.
- Now how much beer will Ralph consume? How many slices of pizza will he consume?
  - Show Ralph's new budget constraint on the same graph as in (1), and mark his new consumption point. How much revenue is raised by the tax?

- B. (3) Suppose instead of a quantity tax, an income tax is placed on Ralph which raises the same amount of revenue as you calculated in (2).
- How much beer will Ralph consume? How many slices of pizza?
  - Show the new budget constraint for Ralph on the same graph as you used for sections (1) and (2). Label his newest consumption point.
  - Compare total utility from sections (2) and (3). Which tax does Ralph prefer?
- (4) Use the values for income and price from (1) to answer this section.
- What is Ralph's income elasticity of demand for beer? Is it a normal or an inferior good?
  - What are the own price elasticity of demand and the cross price elasticity of demand for beer?
- C. Utility theory can be used to explain how people allocate time between different activities. Consider the utility function  $U(x,y) = x + 4\sqrt{y}$ , where  $x$  = hours spent doing homework, and  $y$  = hours spent at a party. Now a budget constraint is measured in time rather than in money. Assume you have six hours the night before this problem set is due, and you can either spend time on this problem set or go to a party.
- What is the price of  $x$  in this model? What is the equation for the budget constraint?
    - Graph the budget constraint. Graph two indifference curves for the utility function.
  - What is the MRS for this utility function?
    - Show whether or not  $x^2 + 16y$  is a monotonic transformation of this function. What about  $4x + 16\sqrt{y} + 5$ ?
  - Using one of the three methods from the Appendix for Ch. 5, solve for the demand functions for  $x$  and  $y$ . Is there anything unusual about either or both of these functions?
  - How many hours will you spend on your homework? How many at the party?
    - You decide to stay awake another two hours, so now you have 8 hours to allocate. Now how many hours do you spend at each activity?
- D. Ben's demand function for chocolate chip cookies is  $10 + \frac{M}{20P}$ ;  $M$ =income and  $P$ =price per cookie.
- Assume Ben's income is \$1000 per month and the price of a cookie is \$1.
    - Graph Ben's demand curve. How many cookies does Ben consume per month? What is his price elasticity of demand?
    - Graph Ben's Engel curve. What is his income elasticity of demand?
  - The price rises to \$5 per cookie. Now how many cookies does Ben consume? How much of this change in consumption is attributable to the substitution effect of the price change? How much is attributable to the income effect of the price change?
  - Ben complains to the manager about this price rise, so the cookie company gives Ben a rebate because he is such a loyal customer. The rebate is the fixed amount of \$80 per month. Can we tell if Ben is now better, the same, or worse off than in (1)?
  - Instead of the rebate, the manager decides to charge Ben \$1 per cookie, but puts a limit of 12 on the number of cookies he can buy. Is Ben better, the same, or worse off than in (3)?