

## Indifference Curves

Assume B. Bop enjoys eating either hamburger 'meals' or pizza 'meals' and shopping every work day over the noon hour. For a given month, let:

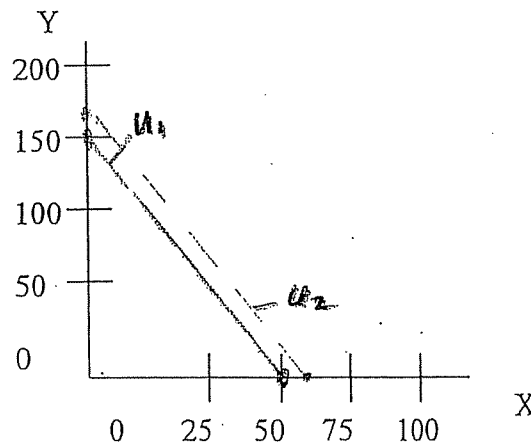
- Y = quantity of hamburger 'meals' purchased  
 X = quantity of pizza 'meals' purchased  
 Z = hours spent shopping  
 U = B. Bop's utility function =  $3X + Y + 2Z$

1. Determine the equation (with Y being the vertical axis variable) for B. Bop's indifference curve corresponding to  $U_1 = 170$  if Z is fixed or held constant at  $Z = 10$ .

$$\Rightarrow 170 = 3X + Y + 2(10)$$

$$\Rightarrow Y = 150 - 3X$$

2. Draw and label as  $U_1$  in Figure D below. Label axis intercept quantities.



3. What is B. Bop's marginal utility of a pizza meal and another hour of shopping? Show derivation of answer.

$$MU_{\text{pizza}} = \frac{dU}{dX} = MU_X = +3$$

$$MU_{\text{shopping}} = MU_Z = \frac{dU}{dZ} = +2$$

4. What is B. Bop's MRS of hamburger meals for pizza meals (calculate value and explain its meaning).

$$= \frac{\Delta y}{\Delta x} = -\text{slope of indiff curve} = \frac{MU_x}{MU_y} = \frac{3}{1} \Rightarrow \text{B. Bop willing to exch 3 y (burger meals) for 1 x (pizza meals)}$$

5. Suppose B. Bop's hours spent shopping (Z) = 5. What is the new equation of his/her indifference curve for U = 170. Draw and label as U<sub>5</sub> in Figure D above. — see graph

$$170 = 3x + y + 2(5)$$

$$\Rightarrow y = 160 - 3x$$

Assume Wendy has a utility function given by  $U = 10YZ$ . Assume Y = vertical axis variable = hamburger meals and Z = hours spent shopping. Use this information to answer questions #6-#10 below.

6. What is Wendy's MU of Y and MU of Z?

$$MU_y = \frac{\partial U}{\partial y} = (1)(10z)y^0 = 10z$$

$$MU_z = \frac{\partial U}{\partial z} = (1)(10y)z^0 = 10y$$

7. What is the equation of Wendy's indifference curve for U = 100?

$$100 = 10yz \Rightarrow y = \frac{100}{10z} = \frac{10}{z}$$

8. What is the value of Wendy's MRS of Y for Z at Y = 5?

$$= \frac{MU_z}{MU_y} = \frac{10y}{10z} = \frac{10(5)}{10z} = \frac{5}{z}$$

9. Explain the meaning of your answer to #8.

$$= \frac{\Delta y}{\Delta z} \Rightarrow \text{Wendy is willing to exch } \frac{5}{z} \text{ burger meals (y) for 1 hr of shopping (=z)}$$

10. Write a utility function for Wendy that would represent Y and Z being perfect complements.

$$U = \min [\alpha Y, \beta Z]$$