

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:

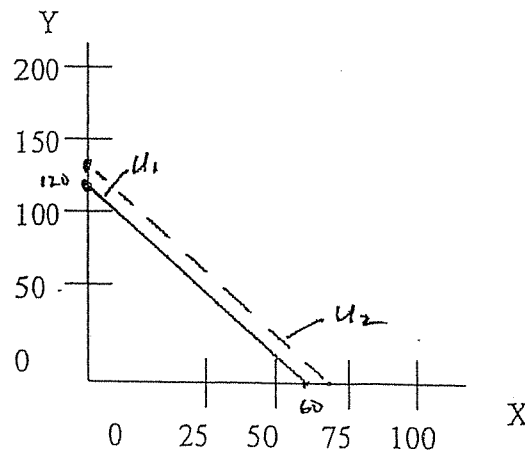
- Y = quantity of hamburger 'meals' purchased
- X = quantity of pizza 'meals' purchased
- Z = hours spent shopping
- U = B. Bop's utility function = $2X + Y + 3Z$

1. Determine the equation (with Y being the vertical axis variable) for B. Bop's indifference curve corresponding to $U_1 = 150$ if Z is fixed or held constant at $Z = 10$.

$$\Rightarrow 150 = 2X + Y + 3(10)$$

$$\Rightarrow Y = 120 - 2X$$

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.

$$MU_{\text{pizza}} = MU_X = \frac{\partial U}{\partial X} = +2$$

$$MU_{\text{shopping}} = MU_Z = \frac{\partial U}{\partial Z} = +3$$

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

$$= \frac{\Delta Y}{\Delta X} \Rightarrow$$

$$\text{MRS} = -\text{slope of indiff. curve} = (-)(-2) = 2$$

$$\text{or } = \frac{MU_X}{MU_Y} = \frac{2}{1} = 2$$

\Rightarrow willing to exch 2 Y (hamburger 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 $U = 150$. Draw and label as U_2 in Figure D above.

$$150 = 2X + Y + 3(5)$$

see graph

$$\Rightarrow Y = 135 - 2X$$

Assume Wendy has a utility function given by $U = 20YZ$. 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 ?

$$MU_Y = \frac{\partial U}{\partial Y} = (1)(20Z)Y^{1-1} = 20Z$$

$$MU_Z = \frac{\partial U}{\partial Z} = (1)(20Y)Z^{1-1} = 20Y$$

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

$$100 = 20YZ \Rightarrow Y = \frac{100}{20Z} = \frac{5}{Z}$$

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

$$\text{MRS} = \frac{MU_Z}{MU_Y} = \frac{20Y}{20Z} = \frac{20(5)}{20Z} = \frac{5}{Z}$$

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

$$= \frac{\Delta Y}{\Delta Z} \Rightarrow$$

Wendy is willing to exchange $\frac{5}{Z}$ hamburger meals for 1 hr of shopping

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

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