Microeconomics module 3 practice problems: indifference curves

** Exercise 3.1: Indifference Curves

An economy has only two goods, bread and wine, both of which have positive economic value.

The baskets (5 bread + 2 wine) and (3 bread + 6 wine) lie on indifference curve *J*, and the basket ((6 bread + 4 wine) lies on indifference curve *K*.

Which of the following cannot also lie on indifference curve *K*?

A. 2 bread and 5 wine
B. 1 bread and 9 wine
C. 0 bread and 15 wine
D. 8 bread and 1 wine
E. 15 bread and 0 wine

Answer 3.1: A

The basket (5 bread + 2 wine) is worth less than the basket ((6 bread + 4 wine), so the indifference curve *K* has more utility than the indifference curve *J*. But the basket (3 bread + 6 wine) is worth more than the basket (2 bread + 5 wine), so it is not possible for the basket (2 bread + 5 wine) to lie on a higher indifference curve.

** Exercise 3.2: Properties of Indifference Curves

A graph shows a consumer's indifference curves for food vs clothing.

A. How many indifference curves does the consumer have?
B. Can two indifference curves intersect?
C. Are indifference curves upward sloping or downward sloping?
D. Are indifference curves convex or concave?
E. How do indifference curves reflect the marginal utility of one good in terms of the other good?
F. Are indifference curves parallel?

Part A: Any consumer has an infinite number of indifference curves, since more of a good increases utility. In practice, goods are not divisible into minutes pieces and eventually a consumer gains no more utility from an extra unit, so we might say that consumers have an uncountably large number of indifference curves.

Part B: Different indifference curves have different utilities, so they cannot cross, and no basket of goods can be on more than one indifference curve.

Part C: Indifference curves are downward sloping if the goods have positive economic value. If the baskets (Y, Z) and (Y′, Z′) have the same utility and Y > Y′, than Z < Z′.

Part D: Indifference curves are convex because of decreasing marginal utility. As the units of a good increase, each additional unit of that good is less valuable to the consumer. More additional units are needed to achieve the same increase in utility

Part E: The marginal utility of one good in terms of the other is the negative of the slope of the indifference curve.

Part F: Indifference curves are not parallel, though they may seem parallel in the graphs.

Jacob: If two curves are parallel, are they straight lines?

Rachel: Parallel means the slopes are the same, though the slopes of each curve may change. Two curves are parallel if one is a linear displacement of the other. If we move the X values α units to the right or left and the Y values β units up or down, the two curves are parallel.

Jacob: Can you give an example?

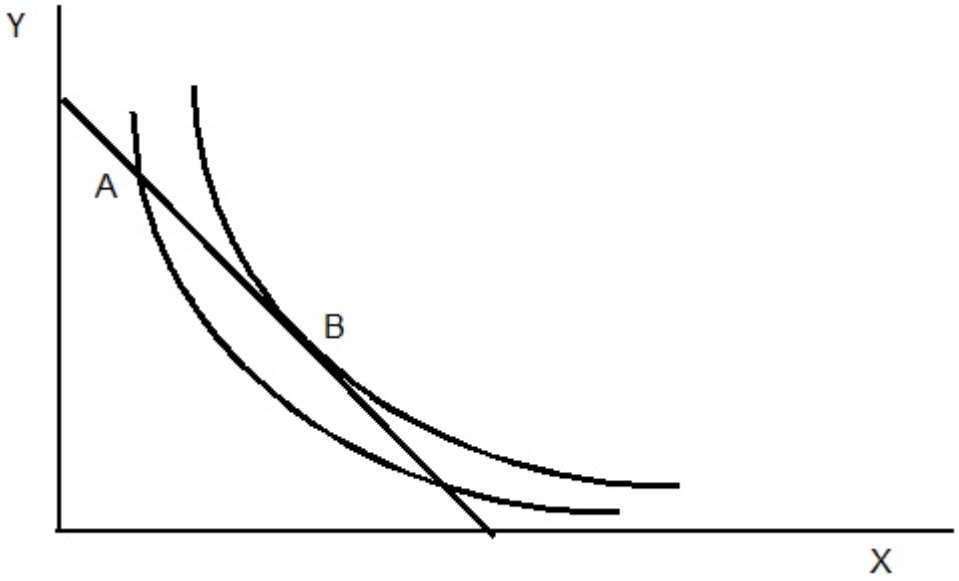
Rachel: Suppose one curve is $xy - 16 = 0$. A displacement of the curve might be

$$(x - 1)(y - 1) - 16 = 0 \Rightarrow xy - x - y - 15 = 0$$

** Exercise 3.3: Marginal Value

(T/F) If the marginal value of X in terms of Y is greater in absolute value than $-P_x \div P_y$, the consumer would be better off buying less X and more Y.

Solution 3.3: False. The consumer would be better off buying *more* X and *less* Y.



This situation is a point like A, where the indifference curve is *steeper* than the budget line. The consumer would be better off at point B, where more X is consumed and less Y.

At point A, the consumer would trade more units of Y for 1 unit of X than the market requires. For example, the consumer may be willing to give up 3 units of Y to get 1 extra unit of X, so the marginal value of X in terms of Y is 3. By contrast, the price of X may be \$3 and the price of Y may be \$1.50, so the slope of the budget line is –2. The consumer is willing to give up 3 units of Y for a unit of X, but finds that he only has to give up 2 units of Y to buy an extra unit of X. The consumer is better off buying more X and less Y, until the rate at which he is willing to trade the 2 goods equals the rate at which he must trade them in the market.

** Exercise 3.4: Indifference curves

Let B = the number of loaves of bread and W = the number of flasks of wine. A loaf of bread costs P(B) and a flask of wine costs P(W).

The consumer indifference curves are $B \times W = K$, where K is a constant.

Illustration: If K = 16, the consumer is indifferent among

- 2 loaves of bread and 8 flasks of wine
- 4 loaves of bread and 4 flasks of wine
- 8 loaves of bread and 2 flasks of wine

The budget line and the indifference curves have bread on the vertical axis and wine on the horizontal axis.

A. What is the slope of the budget line?
B. Write the indifference curves as B = f(W).
C. What is the slope of the indifference curves?
D. What is the value K where an indifference curves is tangent to the budget line?
E. If a loaf of bread costs 3, a flask of wine costs 12, and K = 16, how many loaves of bread and how many flasks of wine does the consumer buy?
F. If a loaf of bread costs 3, a flask of wine costs 12, and K = 16, how much money does the consumer spend on bread and wine?

Part A: The slope of the budget line is $-P(W) / P(B)$.

Part B: $B = K/W$.

Part C: $\partial B/\partial W = -K/W^2 = -B/W$

Part D: At the point of tangency, the budget line and the indifference curve have the same slope:

$$-P(W) / P(B) = -B/W \Rightarrow B \times P(B) = W \times P(W).$$

Part E: If a loaf of bread costs 3, a flask of wine costs 12, then $-P(W) / P(B) = -4$. If K = 16, then $-K/W^2 = -4 \Rightarrow -16/W^2 = -4 \Rightarrow W^2 = 4 \Rightarrow W = 2$: the consumer buys two flasks of wine. $B = 16 / W = 16 / 2 \Rightarrow B = 8$: the consumer buys 8 loaves of bread.

Part F: A loaf of bread costs 3 and the consumer buys 8 loaves of bread, for $3 \times 8 = 24$. A flask of wine costs 12 and the consumer buys 2 flasks of wine, for $12 \times 2 = 24$.

If the indifference curve is $B \times W$ = constant, the consumer spends the same amount of bread and wine, since $B \times P(B) = W \times P(W)$, as derived above.