

Macroeconomics Final Exam Practice Problems: Indifference Curves

(The attached PDF file has better formatting.)

Indifference curves are used in both the microeconomics and macroeconomics courses.

- The microeconomics course uses indifference curves for two commodities (bread and wine) to illustrate free market pricing.
- The macroeconomics course uses indifference curves for leisure and wage income to explain the labor market.

The concepts are the same. Material from one course is valid for the other course as well.

Indifference curves are downward sloping and convex (decreasing marginal utility). The practice problems focus on these two properties. Given a set of points on one indifference curve, determine if another point might be on the same curve.

If you have not taken the microeconomics on-line course, see the discussion forum for that course for additional practice problems.

*Question 1.1: Indifference Curves

Leisure (time not working) is on the horizontal axis and consumption is on the vertical axis. An indifference curve is the locus of points among which the consumer is indifferent.

Three combinations of leisure and consumption on one indifference curve are

1. 20 hours of leisure per day + \$80,000 of consumption per year
2. 18 hours of leisure per day + \$84,000 of consumption per year
3. 16 hours of leisure per day + \$92,000 of consumption per year

Which of the following combinations *might be* on the same indifference curve? (Four of these points can not be on the same indifference curve; one might be on the same curve.)

- A. 22 hours of leisure per day + \$75,000 of consumption per year
- B. 14 hours of leisure per day + \$99,000 of consumption per year
- C. 19 hours of leisure per day + \$89,000 of consumption per year
- D. 21 hours of leisure per day + \$83,000 of consumption per year
- E. 12 hours of leisure per day + \$121,000 of consumption per year

Answer 1.1: E

Leisure and consumption are *economic goods* with positive utility. If one point has more leisure and more consumption than a second point, that point has greater utility.

Indifference curves show *decreasing marginal utility* along each axis. If the two axes are Goods Y and Z, as we reduce Good Y, we need increasing amounts of Good Z to retain the same utility.

- As we reduce Good Y, its marginal utility increases.
- As we increase Good Z, its marginal utility decreases.

Illustration: Three points lie on the same indifference curve: (L_1, C_1) , (L_2, C_2) , and (L_3, C_3) , with $L_1 < L_2 < L_3$. (L is leisure; C is consumption.)

Both goods are valuable, so $C_1 > C_2 > C_3$. As leisure increases along an indifference curve, consumption decreases (and vice versa).

By decreasing marginal utility, $(C_2 - C_3) / (L_3 - L_2) > (C_1 - C_2) / (L_2 - L_1)$. As leisure increases, its marginal value decreases, so we need more consumption per unit of leisure to have the same total utility.

Consider Points 1, 2, and 3.

- Point #1 has the highest leisure and the lowest consumption.
- Point #3 has the lowest leisure and the highest consumption.

We compare the ratios $(C_2 - C_3) / (L_3 - L_2)$ and $(C_1 - C_2) / (L_2 - L_1)$ in \$000 per hour:

- $(C_2 - C_3) / (L_3 - L_2)$: $(\$84,000 - \$92,000) / (16 \text{ hours} - 18 \text{ hours}) = 4.000$
- $(C_1 - C_2) / (L_2 - L_1)$: $(\$80,000 - \$84,000) / (18 \text{ hours} - 20 \text{ hours}) = 2.000$

Decreasing marginal utility means that indifference curves are convex (concave upwards). These three points on the same indifference curve imply that a consumer who has

- ~ 16 hours of leisure a day would pay \$6,000 a year for two more hours of leisure a day.
- ~ 18 hours of leisure a day would pay \$4,000 a year for two more hours of leisure a day.

We infer the following items about this indifference curve:

- The curve is convex between 18 and 20 hours of leisure a day. A consumer who has 19 hours of leisure must receive less than (or equal to) $\frac{1}{2} \times (\$80,000 + \$84,000) = \$82,000$ to be on the same indifference curve.
- The curve is convex between 16 and 18 hours of leisure a day. A consumer who has 17 hours of leisure must receive less than (or equal to) $\frac{1}{2} \times (\$84,000 + \$92,000) = \$88,000$ to be on the same indifference curve.
- The curve is convex between 14 and 16 hours of leisure a day. A consumer who has 14 hours of leisure must receive more than (or equal to) $\$92,000 + (\$92,000 - \$84,000) = \$100,000$ to be on the same indifference curve.

- The curve is convex between 20 and 22 hours of leisure a day. A consumer who has 22 hours of leisure must receive more than (or equal to) $\$80,000 - (\$84,000 - \$80,000) = \$76,000$ to be on the same indifference curve.

The principle of *economic goods* eliminates Choices C and D.

- Point C has more leisure and more consumption than point #2, so it has higher utility.
- Point D has more leisure and more consumption than point #1, so it has higher utility.

The principle of *decreasing marginal utility* eliminates Choices A and B.

- Statement A: Points #1 and #2 imply that leisure is worth \$2,000 an hour. As leisure increases, it is worth less per hour. But Points A and #1 imply that leisure is worth \$2,500 an hour at a higher amount of leisure.
- Statement B: Points #2 and #3 imply that leisure is worth \$4,000 an hour. As leisure decreases, it is worth more per hour. But Points B and #3 imply that leisure is worth \$3,500 an hour at a lower amount of leisure.

Only point E can be on the same indifference curve as Points 1, 2, and 3.

This solution reviews more the concepts of indifference curves. Economics is a science of choices: why consumers choose one situation over another. Much of this course deals with preferences: do people work, consume, save, and invest more in one scenario or another?

*Question 1.2: Indifference Curves

An indifference curve for leisure and consumption is the locus of points (combinations of leisure and consumption) among which the consumer is indifferent. Each consumer has an infinite number of indifference curves that cover the plane.

Joseph has two job offers.

- Job k requires 7 hours of work a day and pays \$49,000 a year
- Job j requires 6 hours of work a day and pays \$44,000 a year

For the indifference curve analysis, we express this as

- Job k is 17 hours of leisure a day and \$49,000 of consumption a year
- Job j is 18 hours of leisure a day and \$44,000 of consumption a year

On July 1, Joseph is just graduated from college and has no savings. On July 2, Joseph wins a \$2 million lottery.

- A. If Joseph is indifferent between jobs j and k on July 1, he prefers job k on July 3.
- B. If Joseph is indifferent between jobs j and k on July 3, he prefers job j on July 1.
- C. If Joseph prefers job k on July 1, he prefers job k on July 3.
- D. If Joseph prefers job j on July 1, he prefers job k on July 3.
- E. If Joseph prefers job k on July 3, he prefers job k on July 1.

Answer 1.2: E

Work is less important and leisure is more valuable to Joseph on July 3 than on July 1, since he is richer on July 3.

- ~ If Joseph prefers leisure to work in some scenario on July 1, he surely prefers leisure to work in that scenario on July 3.
- ~ If Joseph prefers work to leisure in some scenario on July 3, he surely prefers work to leisure in that scenario on July 1.

Statement A says that Joseph is indifferent between an extra hour of work and an extra \$5,000 a year on July 1. We infer that Joseph might prefer the extra hour of leisure on July 3, which is Job j , not Job k .

Statement B is the inverse of Statement A; Joseph might prefer Job k , not Job j , on July 1.

Statement C: Joseph might prefer Job k on July 1 because he needs income. On July 3, when he has less need for income, he might prefer Job j .

Statement D: If Joseph prefers Job j on July 1, he surely prefers Job j on July 3.

Statement E is correct. Even when Joseph is wealthy (on July 3) he prefers the extra \$5,000 of income to the extra hour of leisure. When he is poor (on July 1), he surely prefers the extra income to the extra leisure.

Jacob: Can we say that Joseph prefers Job k on July 1 and Job j on July 3?

Rachel: No. We don't know Joseph's preference for leisure vs income.

- Perhaps Joseph has no use for leisure, and prefers Job k on both July 1 and July 3.
- Perhaps Joseph has great use for leisure, and prefers Job j on both July 1 and July 3.

If Joseph's tastes are the same on July 1 and July 3 except for the effects of greater wealth on July 3, we infer Statement E.