

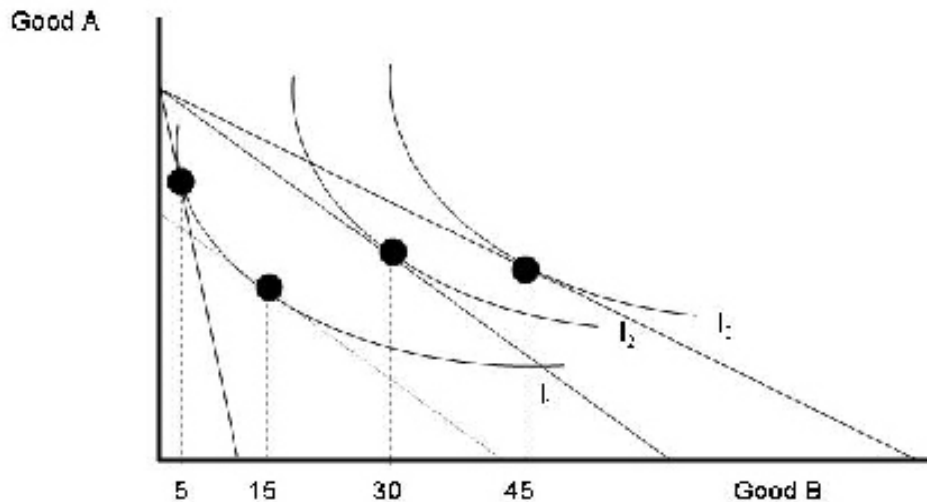
# Assignment 3

ECON3122, Intermediate Microeconomics

Due: Thursday, February 28<sup>th</sup>, by end of class

Directions: Answer all questions completely. Note the due date of the assignment. Late assignments will be accepted at the cost of 15 points per day, up until 3pm on Friday, February 29<sup>th</sup> (before Spring Break). At that time I will return the graded assignments and post the answers on the web. You may turn in assignments to me after that time so that I can check your work for you, but please realize that you will not receive a grade for the assignment. You may work in a group consisting of up to 3 members – for each group please turn in only 1 set of answers and make sure all group member names are on that set of answers. All group members will receive the same grade.

## 1 Income and Substitution (35 points)



The picture above shows a set of indifference curves for a consumer, as well as some budget constraints. We will assume that the price of good A and the income of the consumer are fixed. Suppose that the budget constraints in the picture correspond to prices of \$5, \$3, and \$2 for good B. Note that the faint budget constraint (or the one that does not pivot at the same point as the others) is to be used in determining income and substitution effects. It is in a sense a “hypothetical” budget constraint.

- (5) On the picture, label the budget constraint that corresponds to the \$5 price of good B as “BC5”, label the budget constraint that corresponds to the \$3 price of good B as “BC3”, and label the budget constraint that corresponds to the \$2 price of good B as “BC2”.
- (10) Derive the consumer’s demand curve for good B using these 3 prices.
- (5) Calculate the total effect given a price decrease from \$5 to \$3.
- (5) Calculate the substitution effect given a price decrease from \$5 to \$3.
- (5) Calculate the income effect given a price decrease from \$5 to \$3.
- (5) Is this good a normal good or an inferior good? How do you know?

## 2 Labor-Leisure (55 points)

Suppose that a consumer has a labor-leisure decision to make. The wage rate for this consumer is currently \$6 per hour. However, the government is considering implementing one of two policies.

**Policy 1** The government will pay the consumer an extra \$20 per day if the consumer earns any amount less than or equal to \$48 per day.

**Policy 2** The government wants all consumers to have at least \$48 per day, so the government will pay the consumer an amount  $Z$ , where  $Z = \$48 - Y$ , IF  $Y \leq \$48$ . (Recall that  $Y$  is income.)

- (5) Suppose that the government does NOT offer the extra \$20 per day. Draw a picture of the consumer’s optimal decision (using indifference curves and budget constraints) with income on the y-axis and leisure hours per day on the x-axis. Assume that the consumer’s optimal bundle occurs when he works 8 hours per day. Indifference curves are assumed to have the typical shape (curved, convex to the origin, etc. – no perfect complements or perfect substitutes or any other special cases – the curve does NOT have to be exact in the mathematical sense; actually, it cannot be exact in the mathematical sense because I have not provided you with a utility function). Label the indifference curve that passes through the consumer’s optimal bundle as  $I_1$ .
- (5) Now suppose that the government decides to implement Policy 1. What is the GREATEST amount of hours that the consumer can WORK and still qualify for the additional \$20 per day?
- (10) Draw a picture of the consumer’s budget constraint after the government implements Policy 1. (Hint: The budget constraint will NOT be a continuous line.) Now, look at your picture in part 1. Place  $I_1$  on the graph with the Policy 1 budget constraint.
- (10) Will the consumer’s amount of hours worked increase or decrease (when compared to the original amount of hours worked) if Policy 1 is implemented? Explain why the hours worked will increase or decrease with this new policy. You should be able to reference specific properties of consumer choice when explaining your answer.
- (10) Draw a picture of the consumer’s budget constraint after the government implements Policy 2. (Hint: The budget constraint will be a kinked line.) Now, look at your picture in part 1. Place  $I_1$  on the graph with the Policy 2 budget constraint.
- (5) Will the hours worked be greater under Policy 1 or Policy 2? Explain your answer.
- (10) Suppose you are a government official and had to choose either Policy 1 or Policy 2 as the welfare program for your society. Which one would you choose? Explain why, citing productivity decisions as well as income distribution decisions.

### 3 A Production Table (10 points)

Consider the following production function, where  $q$  is the quantity produced of the good,  $K$  is the quantity of capital used, and  $L$  is the quantity of labor used:

$$q(K, L) = K^\alpha L^\beta$$

- (10) Suppose that  $\alpha = 1$  and  $\beta = 1$ . Fill in the Total Product chart below for the production function based on the input combinations provided.

| K\L | 1 | 2 | 3 | 4 | 5 | 6 |
|-----|---|---|---|---|---|---|
| 1   |   |   |   |   |   |   |
| 2   |   |   |   |   |   |   |
| 3   |   |   |   |   |   |   |
| 4   |   |   |   |   |   |   |
| 5   |   |   |   |   |   |   |
| 6   |   |   |   |   |   |   |

We will do more with production after the break ...

### 4 Bonus (5 points)

Find a formula to calculate the marginal product of capital using the production function in question 3.

Find a formula to calculate the marginal product of labor using the production function in question 3.