

Assignment 3 Answers

ECON3122, Intermediate Microeconomics

Due: Thursday, February 28th, by end of class

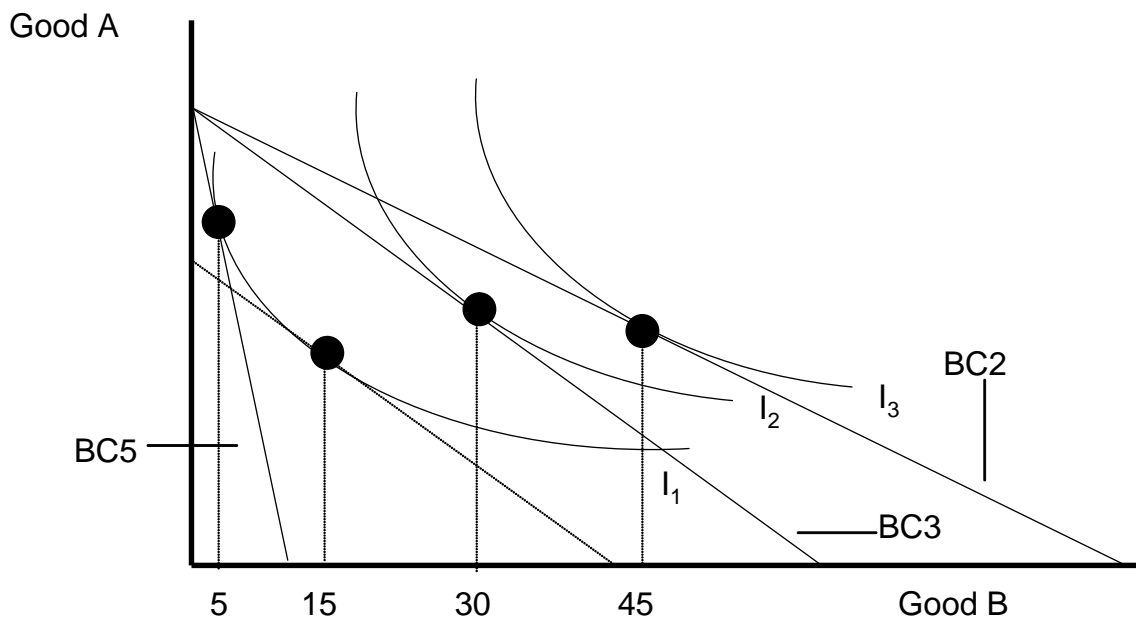
Directions: Answer all questions completely. Note the due date of the assignment. Late assignments will be accepted at the cost of 15 points per day, up until 3pm on Friday, February 29th (before Spring Break). At that time I will return the graded assignments and post the answers on the web. You may 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.

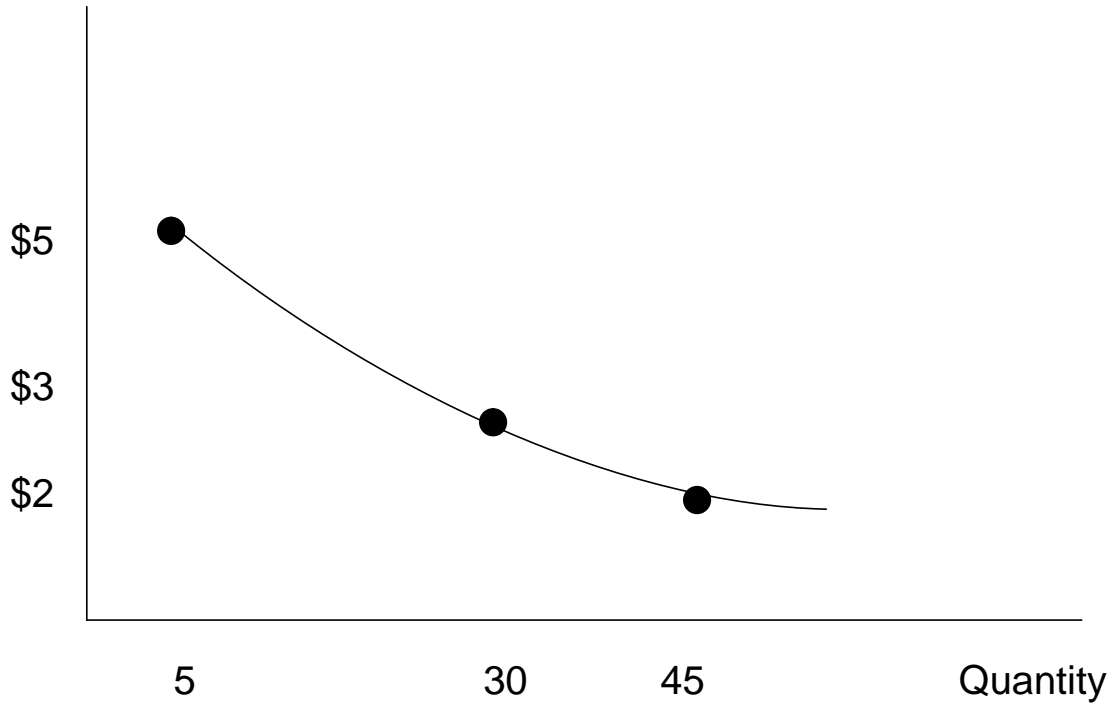
- (5) On the picture, label the budget constraint that corresponds to the \$5 price of good B as “BC5”, label the budget constraint that corresponds to the \$3 price of good B as “BC3”, and label the budget constraint that corresponds to the \$2 price of good B as “BC2”.

Answer:



2. (10) Derive the consumer's demand curve for good B using these 3 prices.

Answer:



3. (5) Calculate the total effect given a price decrease from \$5 to \$3.

Answer:

The total effect is $30 - 5 = 25$.

4. (5) Calculate the substitution effect given a price decrease from \$5 to \$3.

Answer:

The substitution effect is $15 - 5 = 10$.

5. (5) Calculate the income effect given a price decrease from \$5 to \$3.

Answer:

The income effect is $30 - 15 = 15$.

6. (5) Is this good a normal good or an inferior good? How do you know?

Answer:

The good is a normal good because the income effect is positive.

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.

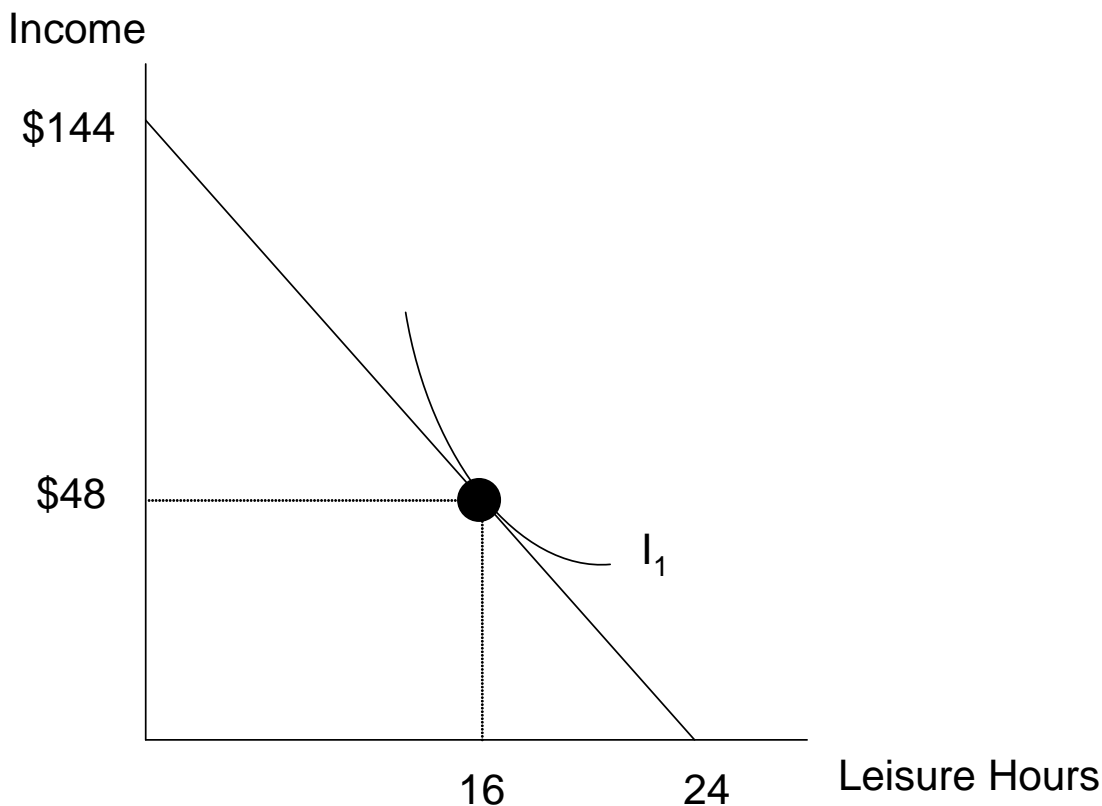
Policy 1 The government will pay the consumer an extra \$20 per day if the consumer earns any amount less than or equal to \$48 per day.

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 .

Answer:

This is just a standard picture with the optimal bundle at \$48 and 16 leisure hours.



- (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?

Answer:

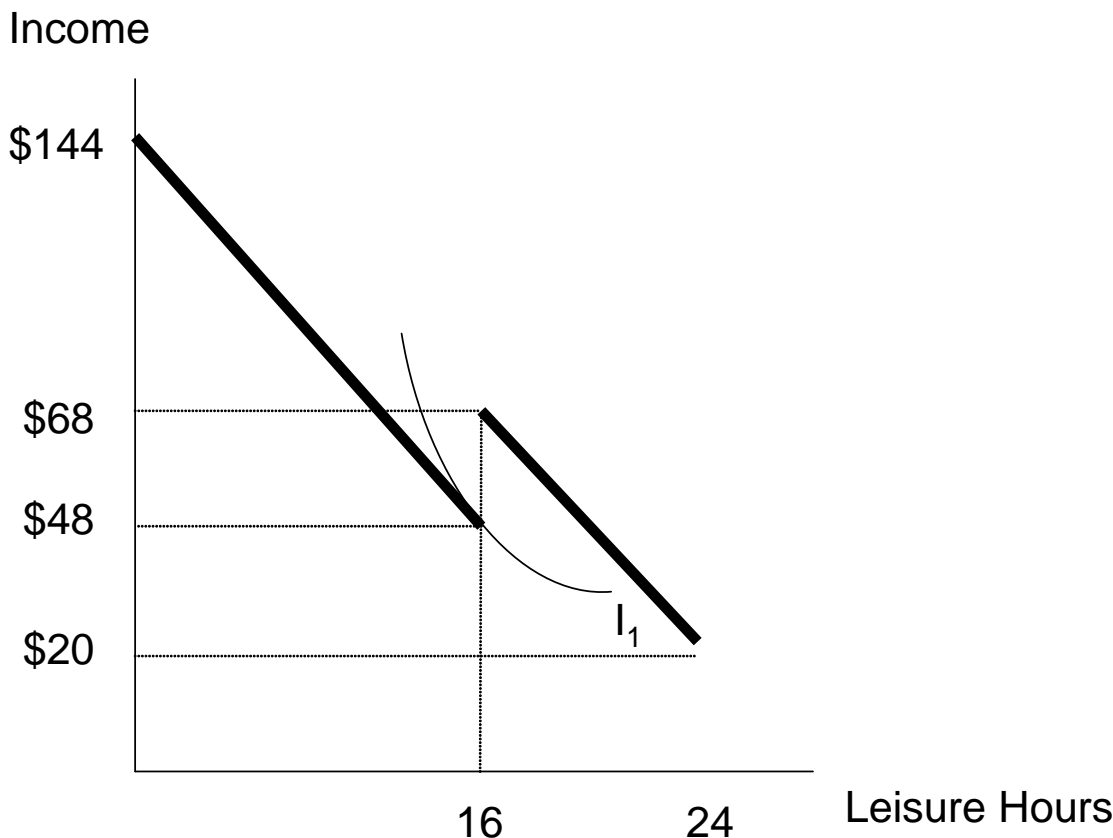
The most hours the consumer can work is 8 hours a day. If he works 8 hours he makes \$48 and just qualifies for the additional \$20.

- (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.

Answer:

The key here is that at 16 hours of leisure the budget constraint “breaks” or is discontinuous. The reason is that for 15.99 leisure hours (or 8.01 hours of work) the consumer only receives $8.01 * \$6 =$

\$48.06, which is less than the consumer will receive if the consumer works exactly 8 hours and qualifies for the additional \$20. This, the budget constraint “jumps” from about \$48 at 8.01 hours of work to \$68 at 8 hours of work, then continues down at the same slope as the original budget constraint. Note that the consumer is guaranteed \$20 if the consumer works zero hours, so the consumer always has positive income. Hopefully by placing the original indifference curve on the new budget constraint it is easy to see the answer to the next question (that the consumer will work less hours) because the old highest indifference curve now cuts through the new budget constraint.



4. (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.

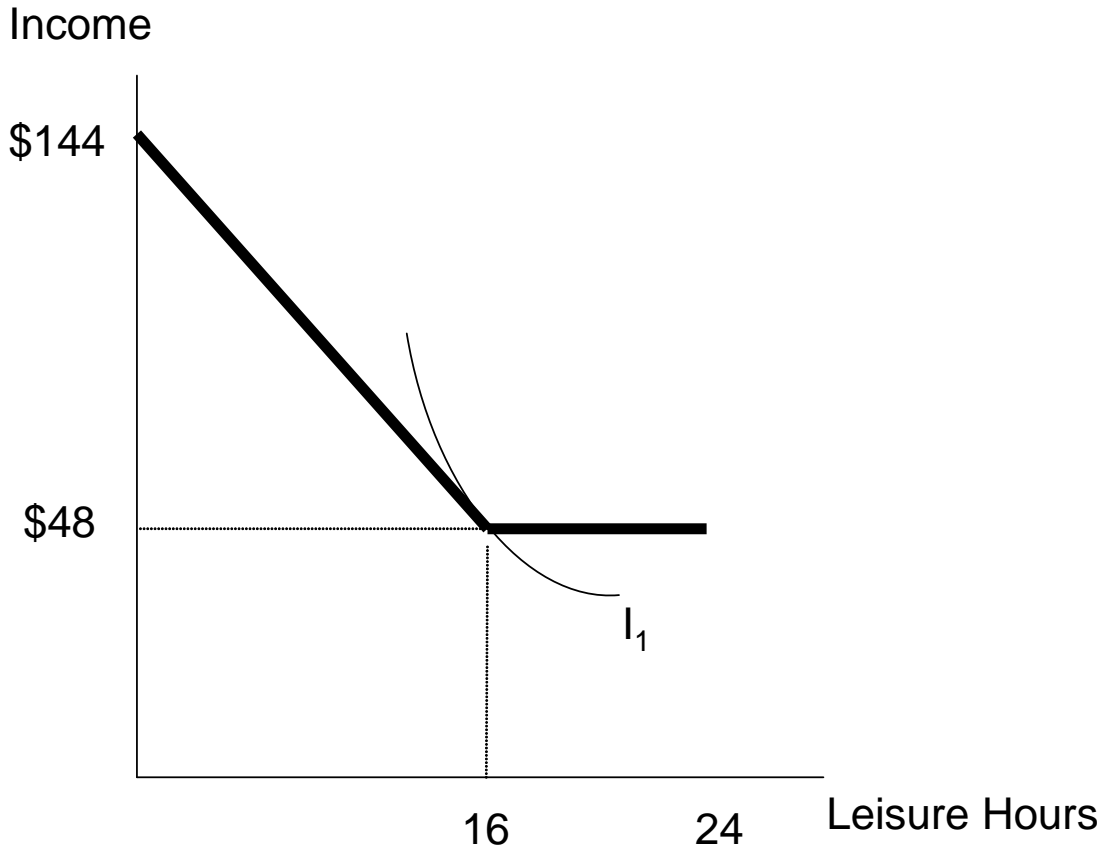
Answer:

The consumer’s amount of hours worked under Policy 1 will decrease when compared to the amount of hours worked under no policy implementation. Under the more is better property of indifference curves, a bundle with more of both goods must be preferred to a bundle with less of both goods. The initial optimal bundle was (16 *leisure*, \$48). However, under this new policy the consumer can shift to some bundle such as (17 *leisure*, \$62). Since there are more of both goods in this new bundle the consumer would prefer to be there. You should note that there are other bundles besides the one I mentioned to which the consumer may shift. At the very least the amount of hours worked should NOT increase, as the consumer could get \$68 with 16 leisure hours.

5. (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.

Answer:

The key here is that the consumer is always guaranteed AT LEAST \$48 of income regardless of how much they work. Thus, once they begin to earn less than \$48 from their job then they receive an additional amount of money to ensure that they are at \$48. If they have \$47 of income, then they receive \$1 ($Z = \1). If they have \$46 of income, then they receive \$2 ($Z = \2), and so on. Thus, the budget constraint becomes flat at 16 leisure hours. Again, hopefully by placing the original indifference curve on the new budget constraint picture it is easy to see that the original indifference curve cuts through the new budget constraint, and if the indifference curve is downward sloping then the consumer should work zero hours and will still get \$48.



6. (5) Will the hours worked be greater under Policy 1 or Policy 2? Explain your answer.

Answer:

The hours worked will be greater under Policy 1. The reason is that the consumer can work 0 hours under Policy 2 and still get \$48. Why would you work at all if you were going to get the same income if you worked 0 hours?

7. (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.

Answer:

This is really an opinion question, but I would suggest Policy 1. At least the people receiving the aid would still work some hours and cause some production to occur. If you chose Policy 2, I have one question for you: How do you fund the program if no one is working?

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.

Answer:

K \ L	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	4	6	8	10	12
3	3	6	9	12	15	18
4	4	8	12	16	20	24
5	5	10	15	20	25	30
6	6	12	18	24	30	36

Thankfully no one that turned in an assignment missed this one ...

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.

Answer:

$$\frac{dq}{dK} = \alpha L^\beta K^{\alpha-1}, \text{ or if you assumed } \beta = 1 \text{ and } \alpha = 1, \text{ then } \frac{dq}{dK} = L.$$

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

Answer:

$$\frac{dq}{dL} = \beta L^{\beta-1} K^\alpha, \text{ or if you assumed } \beta = 1 \text{ and } \alpha = 1, \text{ then } \frac{dq}{dL} = K.$$