

Chapter 3 – Problem 2

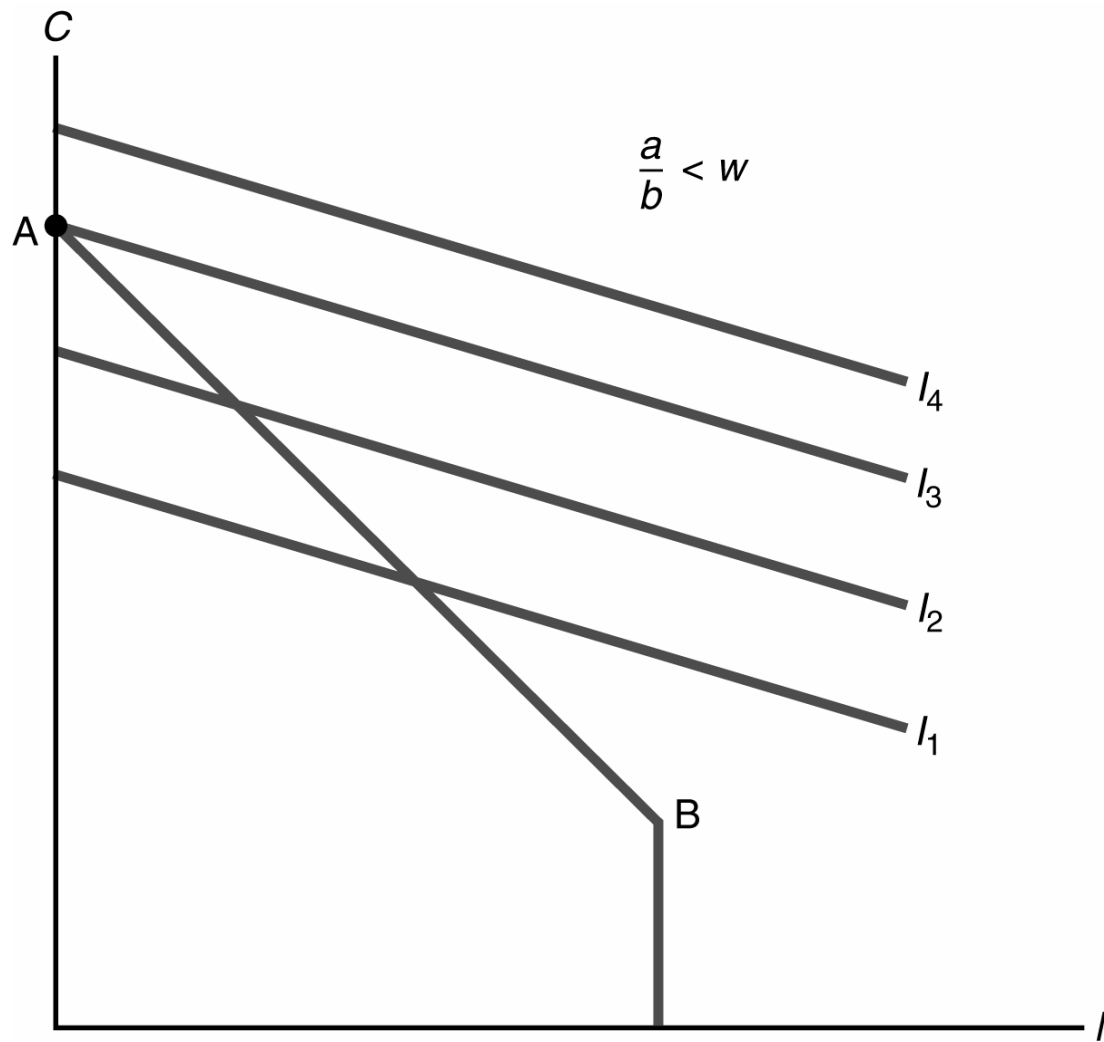
$$u = al + bC$$

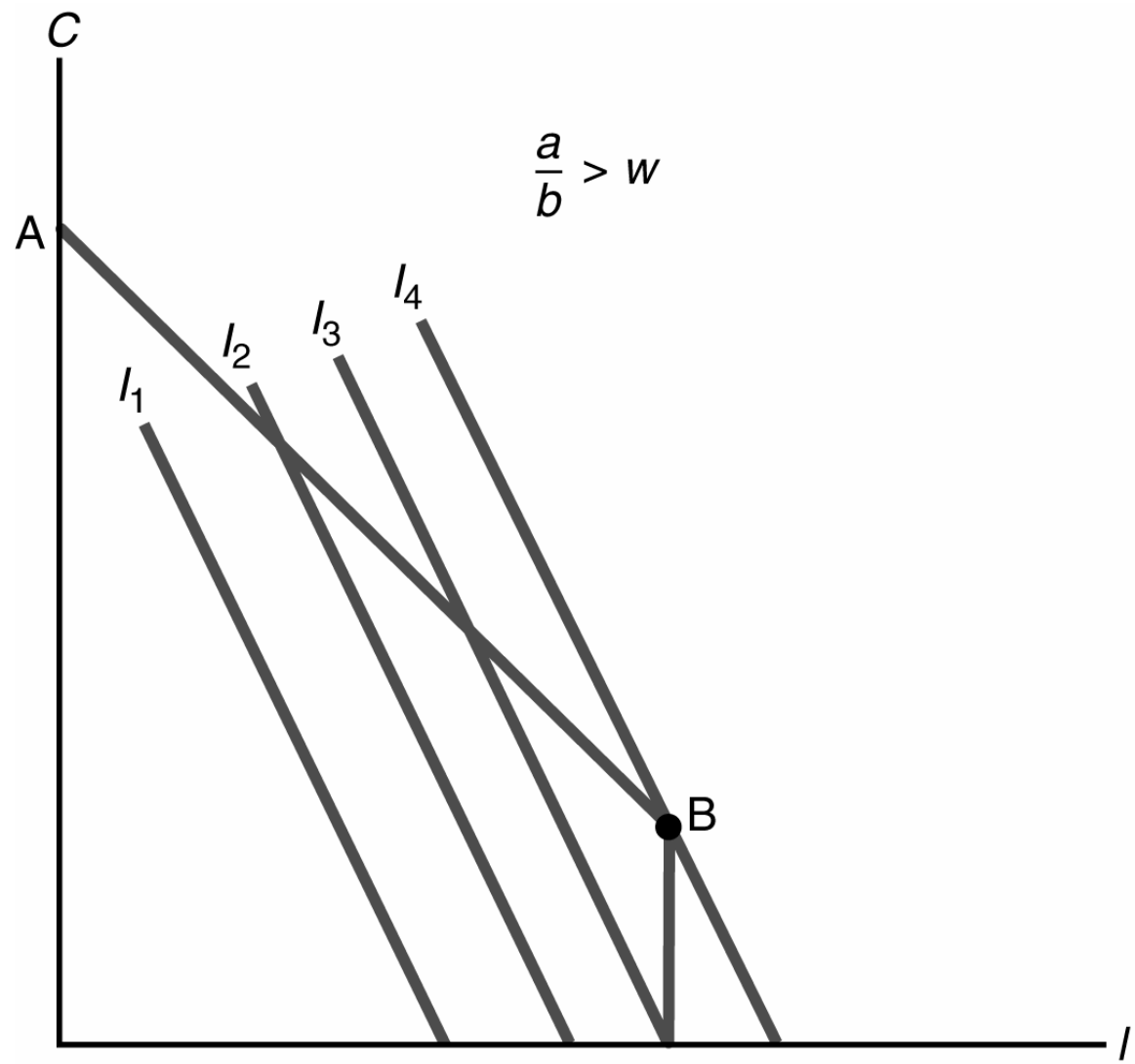
- (a) Each indifference curve corresponds to a specific utility level. Thus, to specify an indifference curve, we hold utility constant, say at \bar{u} . Next rearrange in the form:

$$C = \frac{\bar{u}}{b} - \frac{a}{b}l$$

Why do we keep C on the LHS and l on the RHS?

Indifference curves are therefore linear with slope, $-a/b$, which represents the marginal rate of substitution. There are two main cases, according to whether $a/b > w$ or $a/b < w$. The top panel of the left figure below shows the case of $a/b < w$. In this case the indifference curves are flatter than the budget line and the consumer picks point A, at which $l = 0$ and $C = wh + \pi - T$. The right figure shows the case of $a/b > w$. In this case the indifference curves are steeper than the budget line, and the consumer picks point B, at which $l = h$ and $C = \pi - T$. In the coincidental case in which $a/b = w$, the highest attainable indifference curve coincides with the budget line, and the consumer is indifferent among all possible amounts of leisure and hours worked.





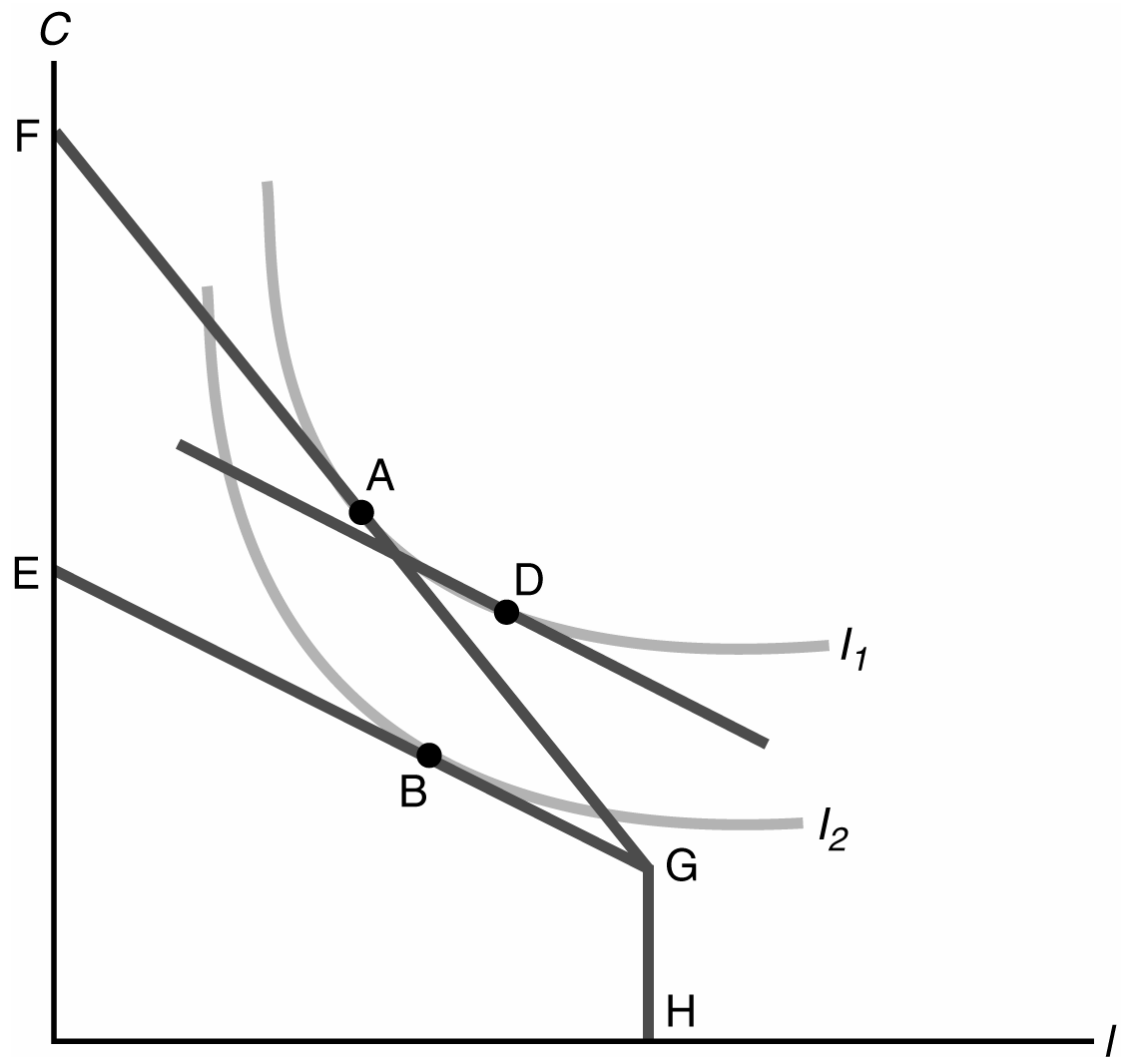
- (b) The utility function in this problem does not obey the property that the consumer prefers diversity, and is therefore not a likely possibility.
- (c) This utility function does have the property that more is preferred to less. However, the marginal rate of substitution is constant, and therefore this utility function does not satisfy the property of diminishing marginal rate of substitution.

Chapter 3 – Problem 3

When the government imposes a proportional tax on wage income, the consumer's budget constraint is now given by:

$$C = w(1 - t)(h - l) + \pi - T$$

where t is the tax rate on wage income. In the figure below, the budget constraint for $t = 0$, is FGH. When $t > 0$, the budget constraint is EGH. The slope of the original budget line is $-w$, while the slope of the new budget line is $-(1 - t)w$. Initially the consumer picks the point A on the original budget line.

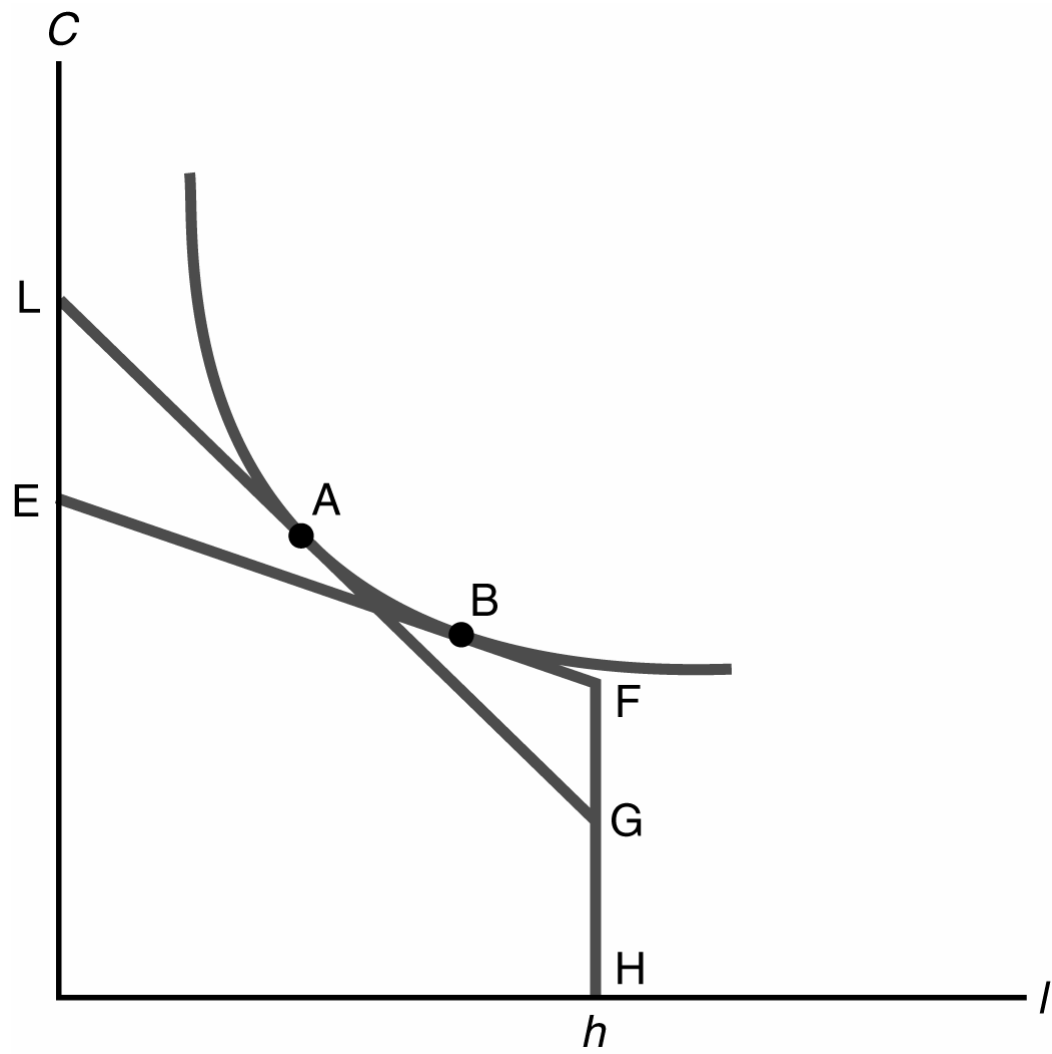


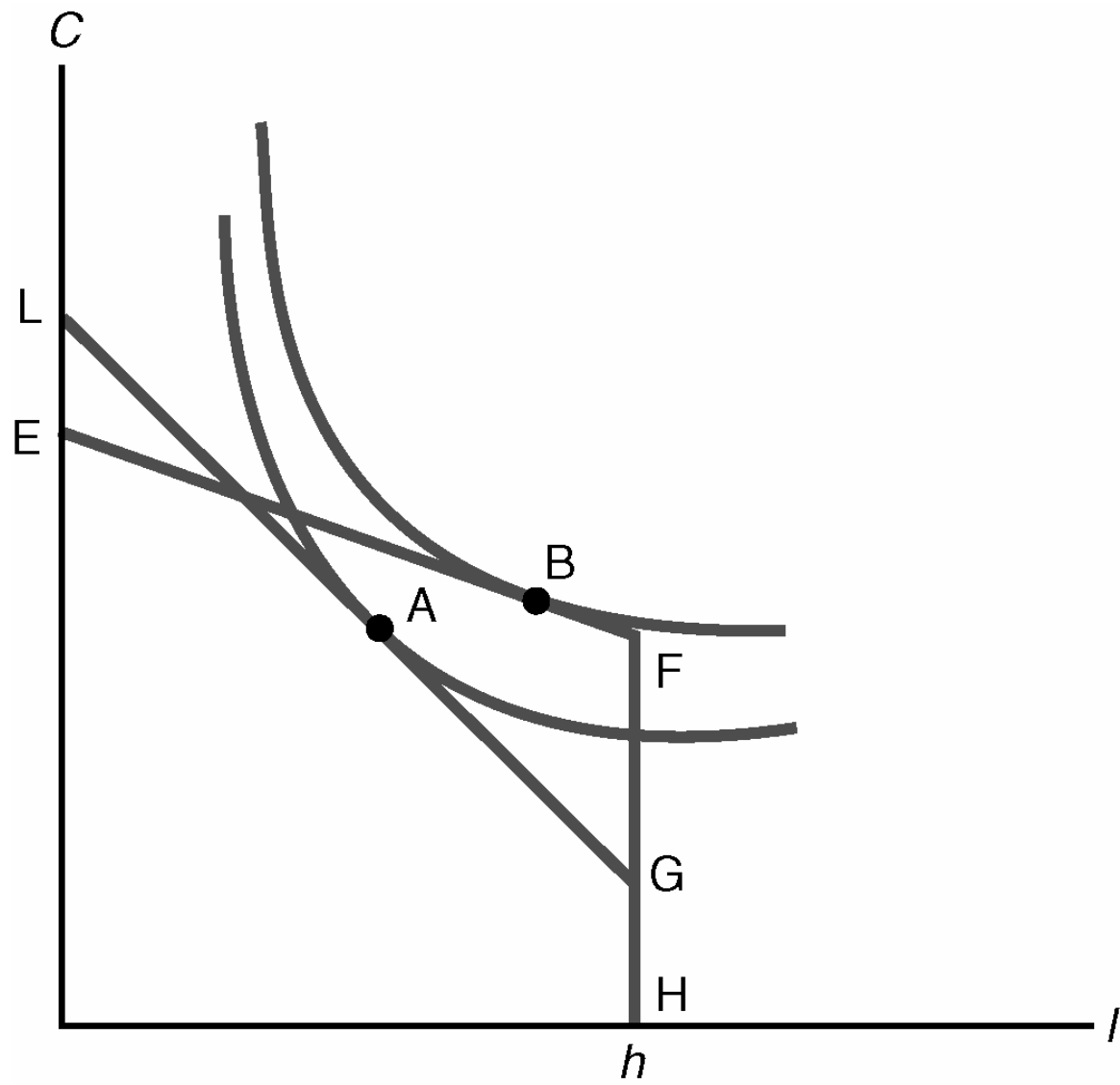
After the tax has been imposed, the consumer picks point B. The substitution effect of the imposition of the tax is to move the consumer from point A to point D on the original indifference curve. The point D is at the tangent point of indifference curve, I_1 , with a line segment that is parallel to EG. The pure substitution effect induces the consumer to reduce consumption and increase leisure (work less).

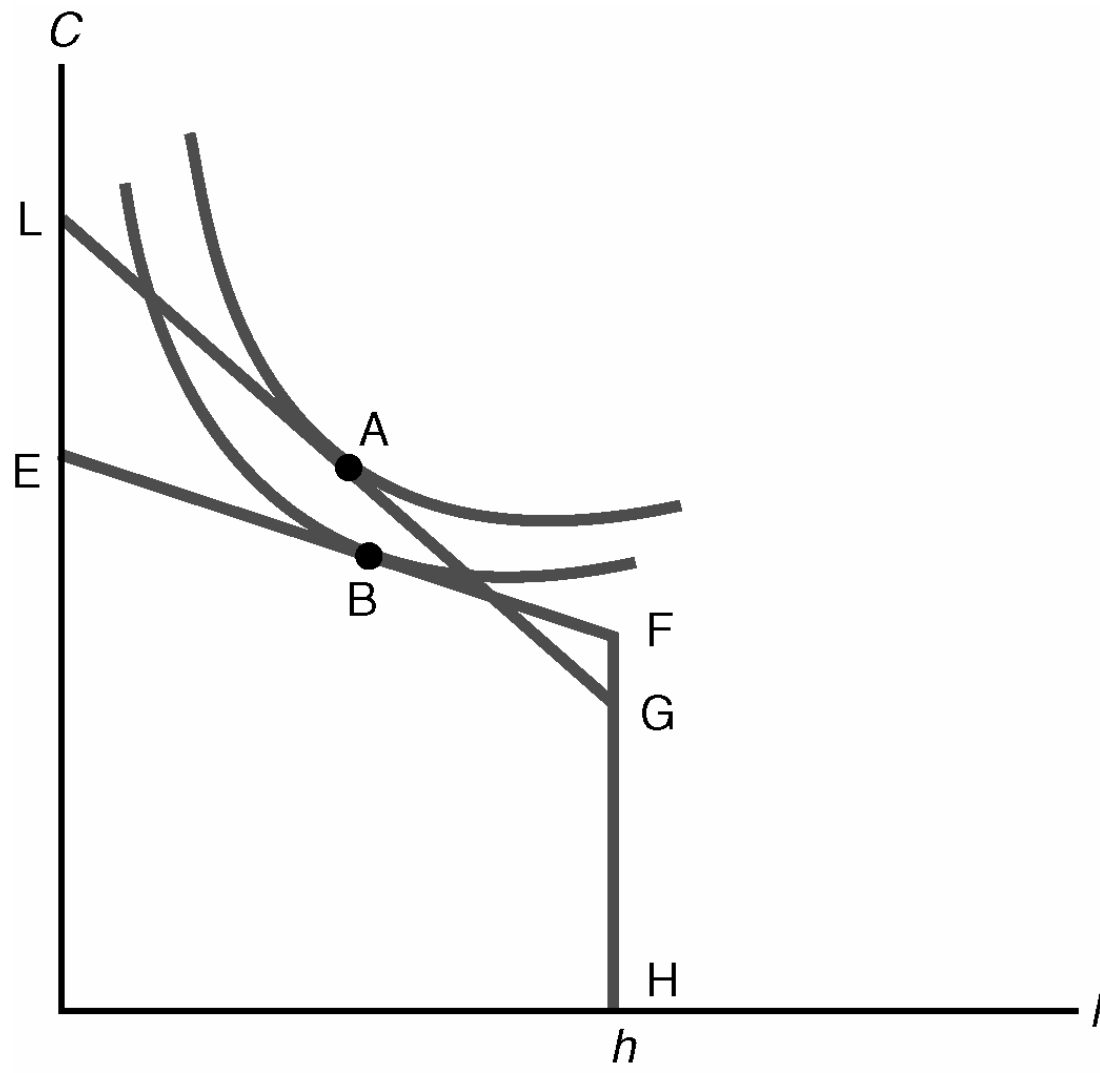
The tax also makes the consumer worse off, in that he or she can no longer be on indifference curve, I_1 , but must move to the less preferred indifference curve, I_2 . This pure income effect moves the consumer to point B, which has less consumption and less leisure than point D, because both consumption and leisure are normal goods. The net effect of the tax is to reduce consumption, but the direction of the net effect on leisure is ambiguous. The figure shows the case in which the substitution effect on leisure dominates the income effect. In this case, leisure increases and hours worked fall. Although consumption must fall, hours worked may rise, fall, or remain the same.

Chapter 3 – Problem 4

The increase in dividend income shifts the budget line upward. The reduction in the wage rate flattens the budget line. One possibility is depicted in the figures below. The original budget constraint HGL shifts to HFE. There are two income effects in this case. The increase in dividend income is a positive income effect. The reduction in the wage rate is a negative income effect. The drawing in the top figure shows the case where these two income effects exactly cancel out. In this case we are left with a pure substitution effect that moves the consumer from point A to point B. Therefore, consumption falls and leisure increases. As leisure increases, hours of work must fall. The middle figure shows a case in which the increase in dividend income, the distance GF, is larger and so the income effect is positive. The consumer winds up on a higher indifference curve, leisure unambiguously increases, and consumption may either increase or decrease. The bottom figure shows a case in which the increase in dividend income, the distance GF, is smaller and so the income effect is negative. The consumer winds up on a lower indifference curve, consumption unambiguously decreases, and leisure may either increase or decrease.



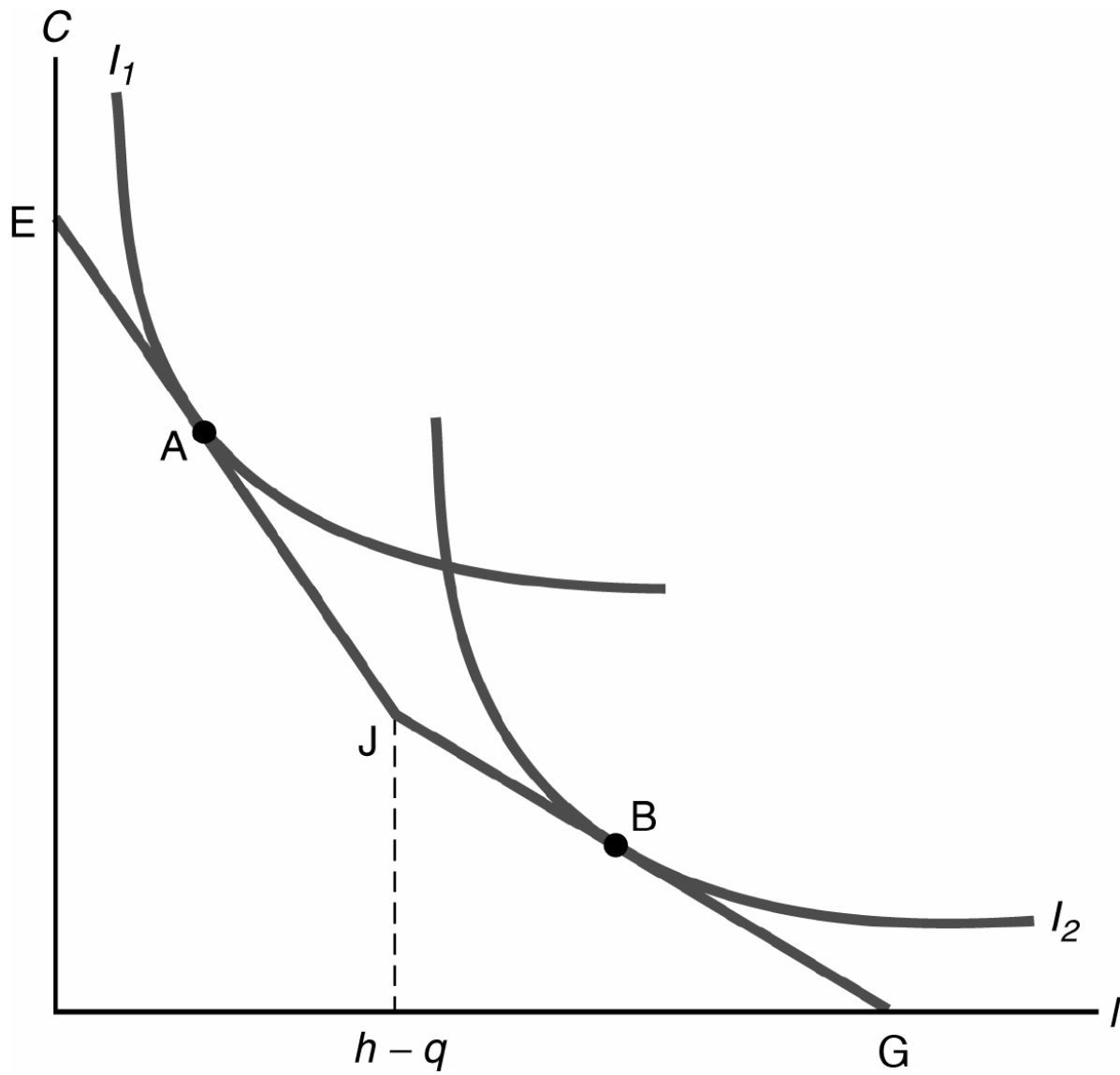




Chapter 3 – Problem 5

This problem introduces a higher, overtime wage for hours worked above a threshold, q . This problem also abstracts from any dividend income and taxes.

- (a) The budget constraint is now EJG in the figure below. The budget constraint is steeper for levels of leisure less than $h - q$, because of the higher overtime wage. The figure depicts possible choices for two different consumers. Consumer #1 picks point A on her indifference curve, I_1 . Consumer #2 picks point B on his indifference curve, I_2 . Consumer #1 chooses to work overtime; consumer #2 does not.



- (b) The geometry of the figure above makes it clear that it would be very difficult to have an indifference curve tangent to EJG close to point J. In order for this to happen, an indifference curve would need to be close to right angled as in the case of pure complement. It is unlikely that consumers wish to consume goods and leisure in fixed proportions, and so points like A and B are more typical. For any other allowable shape for the indifference curve, it is impossible for point J to be chosen.
- (c) An increase in the overtime wage steepens segment EJ of the budget constraint, but has no effect on the segment JG. For an individual like consumer #2, the increase in the overtime wage has no effect up until the point at which the increase is large enough to shift the individual to a point like point A. Consumer #2 receives no income effect because the income effect arises out of a higher wage rate on inframarginal units of work. An individual like consumer #1 has the traditional income and substitution effects of a wage increase. Consumer #1 increases her consumption, but may either increase or reduce the hours of work according to whether the income effect outweighs the substitution effect.

