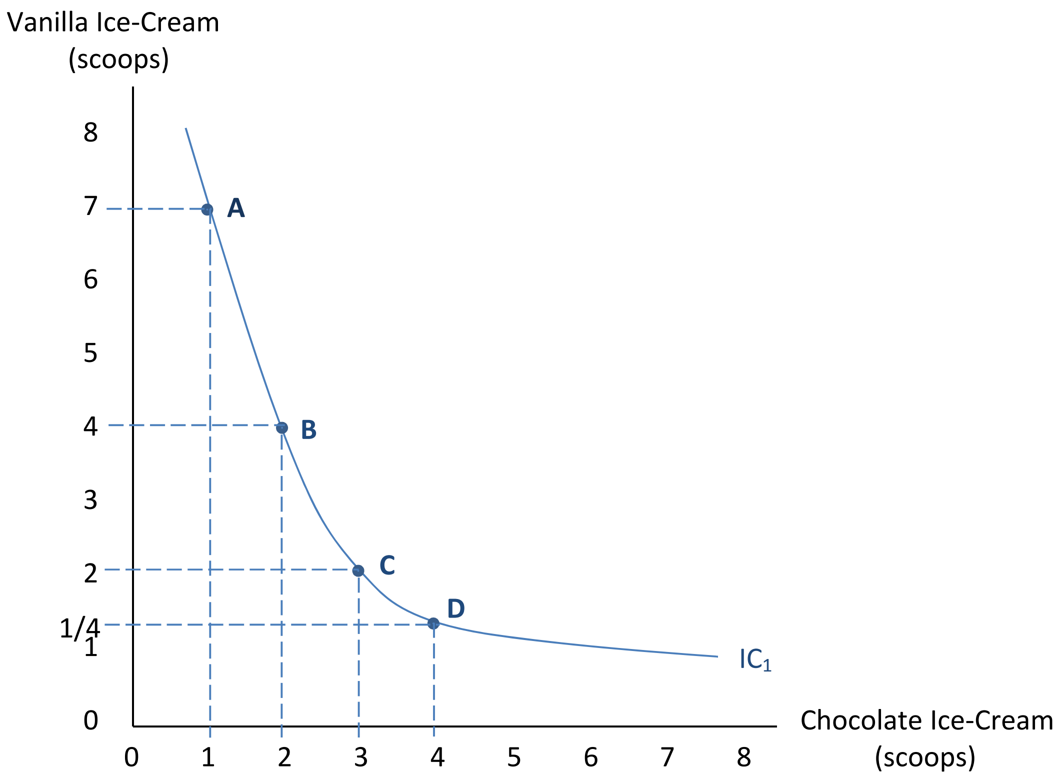
HW 1

Why MRS is diminishing?

Diminishing MRS assumes that consumers like variety. We are willing to give up goods we already have a lot of to obtain more of those goods we now have only a little of. Suppose you can consume two goods: chocolate ice-cream and vanilla ice-cream. At bundle A, you have 1 scoop of chocolate ice-cream and 7 scoops of vanilla ice-cream. How many scoops of vanilla ice-cream would you be willing to sacrifice in order to obtain an additional scoop of chocolate ice-cream given that the level of your satisfaction (utility) is the same? At bundle A vanilla ice-cream is relatively plentiful so you are willing to reduce the consumption of vanilla ice-cream from 7 scoops to 4 scoops in order to get a scoop of chocolate ice-cream. Moving from bundle A to bundle B, the marginal rate of substitution (MRS) is therefore (7-4)/1 = 3. Then we ask the same question at bundle B: how many scoops of vanilla ice-cream would you be willing to sacrifice in order to obtain an additional scoop of chocolate ice-cream given that the level of your satisfaction (utility) is the same? Looking at your indifference curve (IC_1), from bundle B to bundle C, you are willing to reduce the consumption of vanilla ice-cream from 4 scoops to 2 scoops in order to obtain an additional scoop of chocolate ice-cream. Hence, the marginal rate of substitution from bundle B to bundle C is (4-2)/1 = 2. Note that you are willing to sacrifice less of vanilla ice-cream once you've consumed more scoops of chocolate ice-cream. What about moving from bundle C to bundle D? At bundle C, you now consume 3 scoops of chocolate ice-cream but only 2 scoops of vanilla ice-cream. You love variety of goods, so surely we expect that you would be willing to sacrifice less of vanilla ice-cream to get an additional scoop of chocolate ice-cream. You are willing to give up only ¾ scoop of vanilla ice-cream to obtain an additional scoop of chocolate ice-cream as you move from bundle C to bundle D so your MRS from bundle C to bundle D is only 3/4. Clearly, the MRS of chocolate ice-cream for vanilla ice-cream declines as you have once consumed more of chocolate ice-cream or as you move downward to the right along your indifference curve. It's common that the more you have of one good, the less you are willing to sacrifice of the other good to obtain an additional unit of the good you already have a plentiful of, and on the contrary, the less you have of one good, the more you are willing to sacrifice of the other good to obtain an additional unit of the good you are lack of. As a result, it is usually the case that consumers have diminishing MRS.



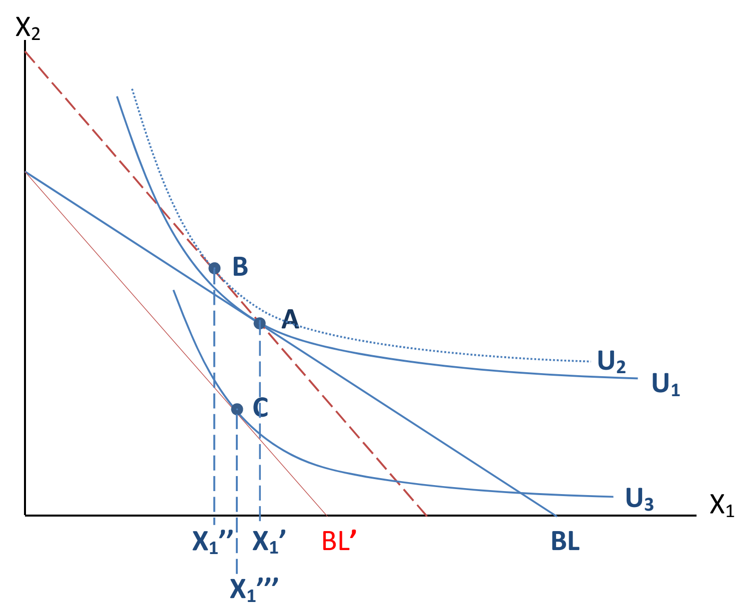
HW 2

Suppose that P_1 rises, draw diagrams to show the cases where X_1 is an inferior good and where X1 is a giffen good. Use Slutsky's approach and Slutsky's equation to explain the effect of a price change.

Case 1: When X_1 is an inferior good

Suppose that the price of good X_1 increases from P_1 to P_1'. As m/P_1 decreases to m/P_1', the original budget line (BL) rotates inward to the new budget line (BL'). Originally, the consumption equilibrium is at point A where U_1 is tangent with BL and level of consumption of good X_1 is equal to X_1'. With the new budget line (BL'), the original utility curve (U_1) is no longer attainable. U_1 is shifted downward to touch BL'. The new consumption equilibrium is reached at point C where U_3 is tangent with BL'.

For the Slutsky's approach, substitution effect is the change in quantity demanded due to the change in relative prices. So the real income is held constant. In reality after the price of good X_1 increases, the real income would decrease but to identify the substitution effect, we need to increase the level of nominal income so that the real income is held constant and to keep the income just enough to obtain the original bundle. Therefore, we construct an imaginary budget line which has the same slope as the new budget line (BL') depicted as the red dotted line. As we increase the level of nominal income, the imaginary budget line is shifted outward until the original bundle is obtained, that is, until the imaginary budget line passes through point A. With this higher imaginary nominal income, a higher hypothetical utility is reached at U_2 and the equilibrium consumption is at point B where U_2 is tangent with the imaginary budget line. From point A to point B, the consumption level of good X_1 decreases from X_1' to X_1'' and this is the result of the substitution effect. To see the income effect, we shift the imaginary budget line back to BL' because in reality we would not be able to attain consumption level at B when price of good X_1 increases. Since X_1 is an inferior good, as income level decreases, we would consume more of good X_1. Hence, from point B to point C, the consumption of good X_1 increases from X_1'' to X_1''' which is the result of income effect. In this case the substitution effect and income would have the opposite direction. We arrive at equilibrium consumption bundle at point C where U_3 is tangent with BL'. The total effect is when the consumption bundle moves from point A to point C where the consumption level of good X_1 decreases from X_1' to X_1'''. As an inferior good, the total effect of increase in price of good X_1 is the decrease in consumption of good X_1. Hence, the substitution effect must be stronger than the income effect.



We can also apply the Slutsky's equation:
$dX_1/dP_1 = (dX_1,s.e. /dP_1) - (dX_1/dm)(X_1)$

Surely (dX_1,s.e. /dP_1) is negative because of the substitution effect (as price of good X_1 increases, you consume less of good X_1).

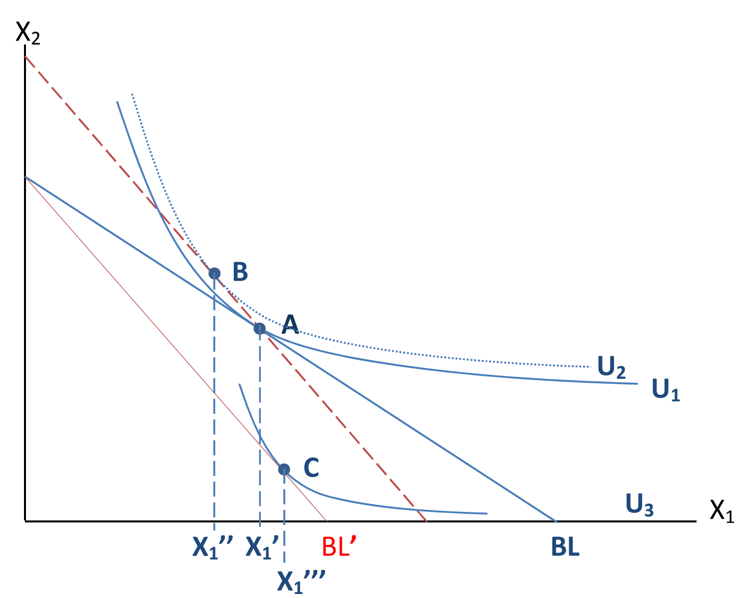
(dX_1/dm) must be negative because X_1 is an inferior good (the more income you have, the less you consume good X_1). So -(dX_1/dm) is positive. And as (X_1) is a positive value, – (dX_1/dm)(X_1) is positive.

Since dX_1/dP_1 or the total effect has to still be negative for the inferior good, we can conclude that (dX_1,s.e. /dP_1) must be greater then -(dX_1/dm) (X_1), or that the substitution effect is stronger than the income effect. So the total effect is dominated by the substitution effect if X_1 is an inferior good.

<u>Case 2: When X is a giffen good</u>

The process of decomposing the substitution effect is the same as in case 1. As price of good X_1 increases, BL shifted inward to BL'. The new equilibrium consumption is reached at point C where U_3 is tangent with BL'. To decompose the total effect into substitution effect and income effect using Slutsky's approach, we construct an imaginary budget line (the red dotted line) which has the same slope as BL'. We shift this imaginary budget line outward until it passes through point A. The hypothetical utility gained from this imaginary budget line is U_2 and the equilibrium consumption bundle is at point B. From point A to Point B, the consumption level of good X_1 decreases from X_1' to X_1'' and hence the substitution effect.

Giffen good is defined as the good that as its price increases, the consumption level of the good will also increase. So we must see the increase in consumption level of good X_1 as its price increases. As we notice that substitution effect has the negative relationship with the price level, we can conclude that for giffen good, the income effect must have the positive relationship with the price level, and in addition, the income effect must have a stronger effect than the substitution effect so that the total effect is the increase in consumption of good X_1 as P_1 increases. Therefore, as the price level of good X_1 increases, we must draw the consumption bundle at point C where the consumption level of good X_1 will be higher than the original consumption of good X_1 (X_1') such as the one depicted in the diagram as X_1'''. Hence, moving from point B to point C is the result of income effect where consumption level of good X_1 increases from X_1'' to X_1''. In the end the total effect is from point A to point C where consumption level of good X_1 increases from X_1' to X_1'''. As a result, if X_1 is a giffen good, it must be the case that the income effect is stronger than the substitution effect.



We can also apply the Slutsky's equation:
$dX_1/dP_1 = (dX_{1,s.e.} /dP_1) – (dX_1/dm)(X_1)$

For a giffen good dX_1/dP_1 must be positive (as price of good X_1 increases, the consumption level of good X_1 also increase).

Since we know that $(dX_{1,s.e.} /dP_1)$ is negative for sure because of the substitution effect (as price of good X_1 increases, you consume less of good X_1), we must have – $(dX_1/dm)(X_1)$ being a positive value. As (X_1) is positive and we have a negative sign in front, we know that (dX_1/dm) must be negative.

To have a positive dX_1/dP_1, we also need the magnitude of $(dX_1/dm)(X_1)$ to be bigger than that of $(dX_{1,s.e.} /dP_1)$. Hence, the income effect must be stronger than the substitution effect. Therefore, the total effect must be dominated by the income effect if X_1 is a giffen good.