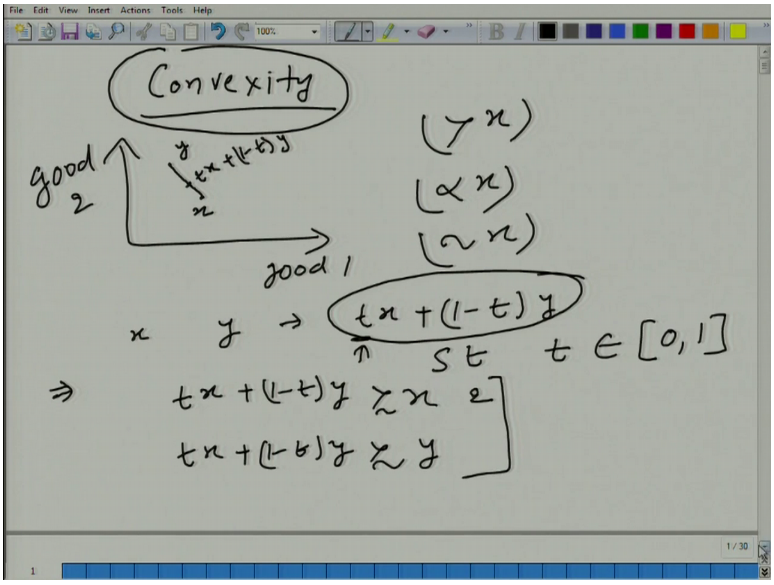
An Introduction to Microeconomics
Prof. Vimal Kumar
Department of Economic Sciences
Indian Institute of Technology, Kanpur

Lecture – 50
Properties of Preferences: Convexity

So now, we are going to talk about convexity either you call it axiom or property, but we are going to talk about convexity.

(Refer Slide Time: 00:15)



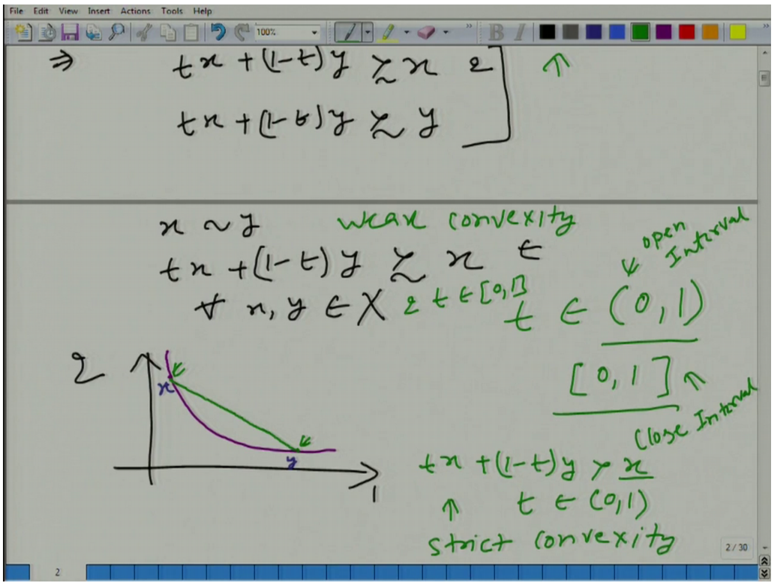
What do we mean convexity? We have already learned, let me remained you that what did we say we say a set is convex when we take two elements from that set and we draw a line of course, that set has to be in Euclidean plane or you know it should be, it should satisfy some geometric properties then only we can draw a line through two of the elements. But whenever we can draw a line between two elements if the line is completely contained in the set then the set is called convex set, that is what we have learned.

Now, we are talking about convexity property that our preference should satisfy. I am not, again I am not saying that everyone everyones preference should satisfy this property, but again we are going to use some mathematical tools and it becomes lot easier to deal with someones preference if it satisfies the convexity axiom. So, what do I mean? I already told you that whenever we take a bundle let us say we take a bundle and again for simplicity I am drawing it in two dimensional world or two good world where I have good 1 here and good 2, good 2 here. And whenever I take a bundle let us say x it divides the consumption set in to 3 mutually exclusive set. One is set which says with the set which contains all the bundles which are preferred over and all the bundles over which x is preferred by this individual and third x is indifferent.

So, what I am saying that instead of now talking one bundle now we take two bundles. Let us say these bundles are x and y these two bundles are x and y, and what we do? We draw a straight line connecting x to y what will be the equation of that straight line, equation would be t x plus 1 minus t y where such that p is between 0 and 1. Let me say here this is y and we have a straight line x y. And what does this t denote? This bundle this part of the bundle that we are talking about, we can (Refer Time: 03:15) this bundle can be anywhere on this line.

So, this distance of the total distance from x and we will have depending on value we will have this bundle here t x plus 1 minus t y. I will also talk about graphically what it means. But let us look at it mathematically also. We say that in an individuals preference satisfies convexity property or convexity axiom if this bundle is, if this bundle is at least as preferred as x and this bundle is also at least as preferred as y it has a simpler statement. Let us look at the simpler statement.

(Refer Slide Time: 04:20)



What we will do? We will take x and y such that that x and y are indifferent, the person is indifferent between x and y. Means this individual if he doesnt have any monitory consideration then he is equally well off, he gets equal level of satisfaction whether he chooses x or he chooses y. So, he is indifferent between x and y.

So, in this case this bundle should be at least as preferred as x then we say of course, this is true for, this is true for all x and y in the consumption set. If you did not understand the mathematical definition it is let us look at it graphically. What we have here is indifference curve, what does it mean? You take any bundle on this curve and the person gets equal satisfaction. So, we are picking any two bundle x and y.

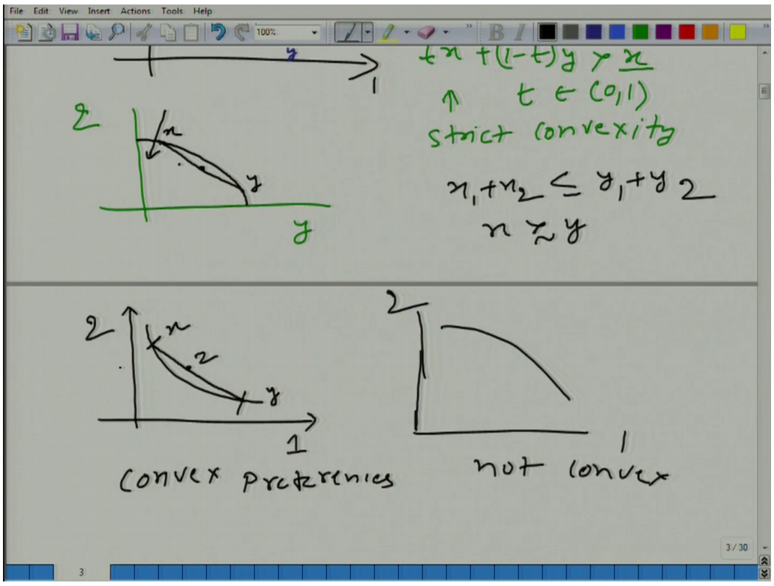
And then we draw a straight line, let me make it you know different indifference curve, so it would be more clear, this is the indifference curve and we are picking here x and y, and let us take a straight line connecting x to y. What it means is that the all the bundles on this green line, what does this green line indicates? A linear combination of x and y. All the bundles on this green line is at least as preferred as x and y is it clear. This is one statement of convexity.

We can talk about even stricter definition of convexity, and what is that? What we say that of course, when we have we are drawing the line and we talk about any any point on this line then x is also on this line and y is also on this line. So, x cannot be strictly preferred to itself using reflectivity it has to be at least as preferred as itself fine. So, what we do in the strict convexity we exclude these two points, it means we restrict t between 0 and 1. Again just for notation this means any real number between 0 and 1 including 0 and 1, while this one means that any number between 0 and 1, but excluding 0 and 1 this is called open interval, this is open interval and this is closed, close interval.

So, now if we limit our self to this open interval and what we have is that all the points on this straight line excluding x and y is strictly or is strictly preferred to x and y then we say, that preference satisfies strict convexity. So, here what we have is t x plus 1 minus t y, we do not have to say we do not have to indicate what happens with respect to y because the person is indifferent between x and y and t is between 0 and 1, excluding 0 and 1 this is strict convexity.

While the earlier one is and this is weak convexity or in other word all the points in case of just convexity all the points on green line are elements of set which represents all the bundles which are at least as good as x or y fine. So, mathematically it is clear to you.

(Refer Slide Time: 09:20)



Let me ask you, that if your indifference curve is like this is it convex. Let me tell you, you are wrong. How you are wrong? Because I drawing just one indifference curve I do not know where in this zone because you are assuming monotonicity, if you assume monotonicity then of course, it is not convex because take any two points, any two points and you draw a line of course, this is a very poor drawing but what is happening here, using monotonicity you can say this is less preferred than x and y that is why it is not convex. But go back to the an example that I gave you where what we had that if x 1 plus x 2.

Student: Less than or equal to y.

Less than or equal to y 1 plus y 2, then x is as preferred as y that is what I talked about. So, not exactly the same we have something like this indifference curve and your utility is increasing in this direction then this is convex, is it clear. In that case it is convex. Why? Because in this direction utility is increasing, if I pick any bundle on this line let us say this line this bundle is preferred over x and y. So, in that case, in this case it is convex. So, before you know you have to be very very clear what you are talking about, which assumptions we are applying, which assumption we are leaving out fine, it is clear.

Now, can you tell me what does it mean? Of course, we are talking about it, but what does it mean? Mathematically it is clear to you I believe, but can you explain intuitively what does it mean.

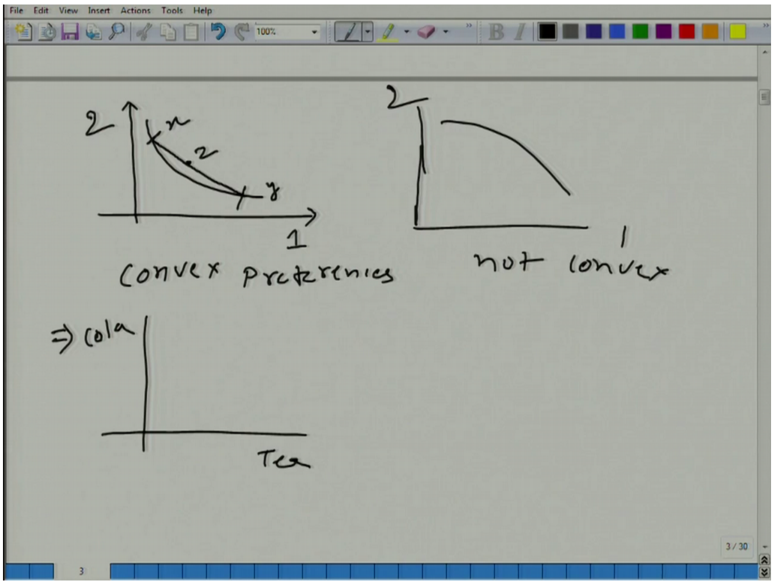
Student: (Refer Time: 11:26) that the amount of (Refer Time: 11:29).

[FL]. So, you are talking about you are at least in the right direction you are talking about that marginal rate of substitution that we have not discussed, but we will discuss it. But even before that what we have here, let us look at it let us compare this and of course, here I am assuming monotonicity is satisfied. So, I can I say convex preferences not convex fine, and I am taking a bundle here x, and I am taking a bundle y, and if I am taking a average or any weighted average and I am taking a bundle here, what it means? That this new bundle let us call it z it is at least as preferred as x or it may be more preferred.

So, can I say that an individual preference exhibits convexity if that person prefers balance bundle over extreme bundles, kind of its balancing out you know here what is happening in the bundle x you have lot of good 2 and very little of good 1, while in y what you have in this example lot of good 1, but very little of good 2. And how about the weighted average of these two, because all the bundles on this straight line connecting x and y they are weighted average of x and y.

What you have is the kind of balance between these two. So, here one interpretation could be that you prefer a balanced bundle over extreme bundles. When it is true all the time then your preference exhibits convexity, is it clear. Now, can you tell me an example when it is true and when it is not true?

(Refer Slide Time: 13:46)



An example when it is true first let us start with when it is not true let us say good 1 you have tea and good 2 is cola and I am taking about my consumption at present. I may let us say I am in different between a cup of tea and a 200 ml of cola. But of course, for most of us that we would prefer these extreme bundles extreme bundle according to our definition according to the way we have discussed over the mix of cola and 200 ml of the weighted average of cola and one cup of tea. So, their convexity would be violated.

But how about let me say, how about if I take over take average over a month or an year. What it means is that some time I would prefer if tea, sometime I would prefer coke it is not that all the time I would be going for tea only. So, that is how we justify. That even in this case convexity is not violated if we take a longer duration of time is it clear, fine. And you can find such example where mixing two goods would decrease the pleasure using this I you can create example where you your preference exhibits convexity, fine. That is one example.