An Introduction to Microeconomics
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Lecture - 76
Axioms/ Assumptions Continued

Now, we also talked about just we will have little recap here, we also talked about axioms.

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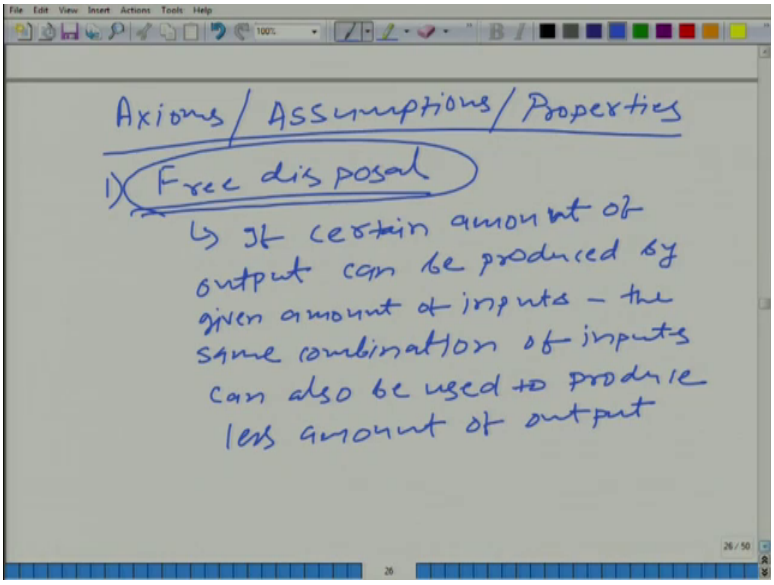

Assumption you can say axiom assumptions, or you can say also properties that is this technology that we talking about satisfies. And I am going to talk about only few of them there are modes. So, one we said free disposal what does, it mean that throwing away inputs throwing away inputs is cost less, you can dispose of inputs without spending any resources fine, or in other word if certain amount of output can be produced by given amount of inputs given amount of you can say combination of inputs, then the same combination of input puts can also be used produce less amount of output in other word. If I say that you know we talk about production function when we have only 1 input and only 1 output and we say that.

For example let us say that we need only milk to produce curd. So, if 1 kg of milk van produce can be used to produce half kg of curd then of course, 1 kg of milk can be used to produce only 250 grams of curd. So, here what we are saying basically what we are talking about the free disposal that some of the input can be thrown out costlessly again think about it, why we are talking about it because we are talking about all the feasible combination of inputs and outputs, that is way I am describing it in particular fashion. So, if it is feasible to produce half kg of curd from 1 kg of milk, then it is feasible to produce 250 grams of curd from 1 kg of milk.

So, the key word is feasibility technology represents the feasibilities that the combination of inputs and outputs, that can be achieved in this world even the current level of technology fine so that is free disposal.

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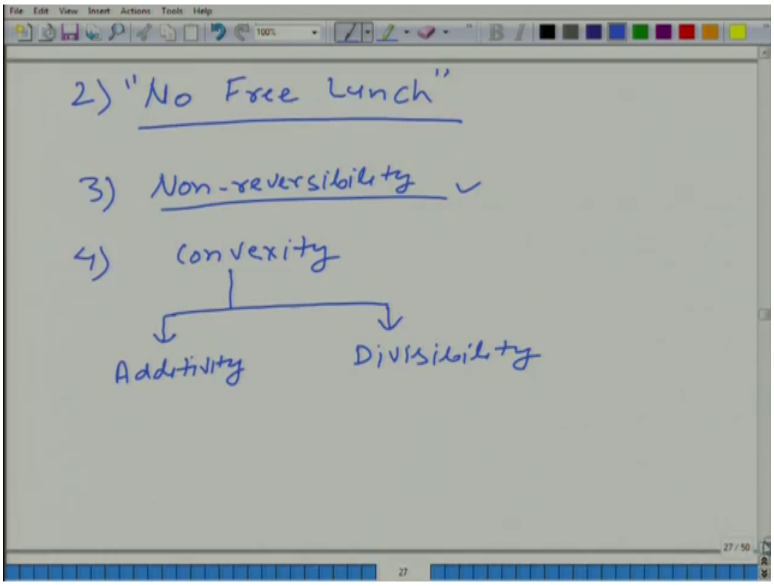

The second is no free lunch. And this is quite famous term that we use in economics again and again at no free lunch and what does it mean here, but at least 1 input is required to produce some output, or more than you know more than 1 kind of output. So, at least 1 input has to be there, you cannot produce something out of tenure you cannot consume something like, one example would be in the harry potter world, if we have watched harry potter movies, then harry potter cannot get nice feazed you know just from the teenier and, if not harry potter if you have read Chandrakantha book in hind there, also you know people would create something out of nothing that is not possible in the real world.

So, that is what we are talking about no free lunch. Third is non reversibility, what it means is that a production process cannot be reversed. So, if you obtain half kg of curd from 1 kg of milk, you cannot obtain 1 kg of milk from half kg of curd, in this example if quite clear, but you can say that let us say if 1 kg of steal is use to create 1 kg of nails steal nail, then we can melt it and we can get 1 kg of steal, but the point here is that to get 1 kg of nail from 1 kg of steal, you have used certain amount of labor, certain amount of energy, you may get the steal back, but you would not get that energy consumed in the process energy spent in the process and labor hours spent in the process back.

So, in that sense all the production and processes are irreversible. And if you are familiar with the thermo dynamics principle, if we have reversibility in the production process, then it would violet the laws of thermo dynamics ok. In basically it is related to in trampy, if you are not familiar with this term forget about it, but you should just remember that a production process cannot be reversed fine ok. Next is convexity ok, but before we talk about convexity we are going to talk about additivity that we talked about earlier and divisibility fine what is additivity.

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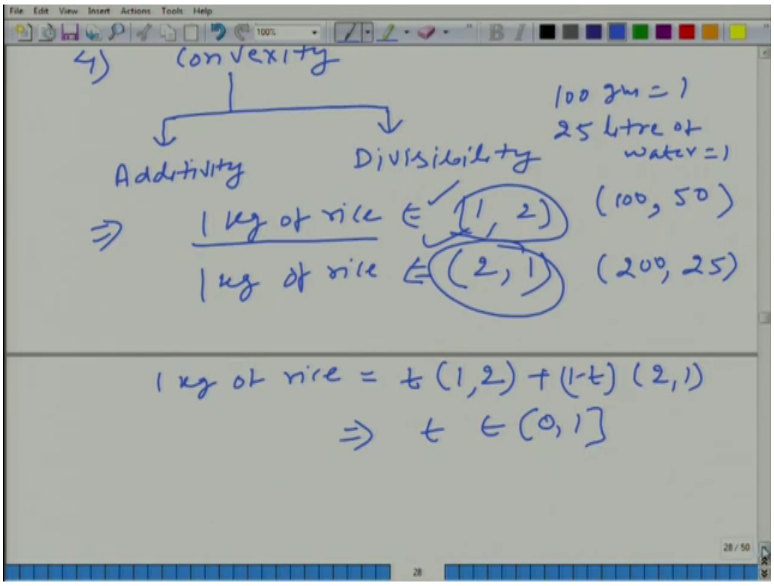

Let us say that for example, 1 kg nail that we are talking about, it needs labor and cap labor and snail only two things just keep it simple let us say that there are no other things required.

So, let us say to get 1 kg of nail we need 1 kg of probably this is not very good example, let me change it. Let us say to write a software code 1 software code of course, we will have to define what do we mean by 1 software code, but let us say that there is such definition it requires either 2 man hour, and this is also not yet good example let me think of something else. To produce 1 kg of rice ok, you need either let us say 100 grams of fertilizer let us say I am writing 100 grams of fertilizer as 1 and, 50 liters of water that I am writing as 2 let us say I can say 100 grams of fertilizer is 1 and 25 liter of water is 1 fine, same 1 kg of rice can be produced by 200 grams of a using 200 grams of fertilizer. So, 2 and 25 liters of water of course, we need land, but that is fixed those are fixed, we are not talking about it only these 2 are variables. So

Student: Should not, has be 2 like 1 kg of rice gives 1 and 2.

No not give this is 1 kg of price is output.

Student: And the single digit in there that of (Refer Time: 08:29).

So, what I am saying here let me write it in this term this is 100 grams and this is 50 liter and, here it is 200 grams and 25 liter. So, that is what I am using 1 comma 2 and 2 comma 1, fine what additivity says that if these 2 are true, then 1 kg of rice can be produced using any linier combination of these two. Let us say let me write we have already learned how to write the linier combination of 2 points in this is space were t is of course, between 0 and 1 why we are saying it let us take 1 approach here. Now of course, we have figured out that 1 kg of rice can be used can be produced from 1 comma 2 and 1 kg of rice can be produced 2 comma and 1.

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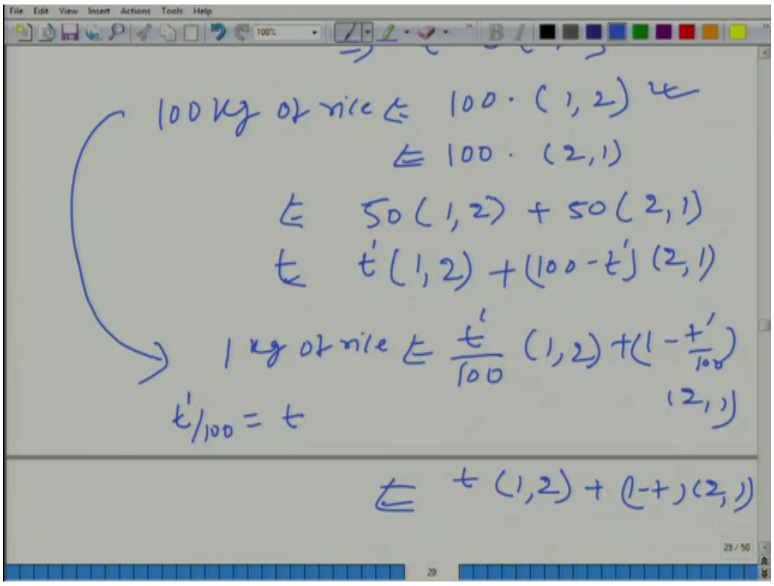

And we need to produce let us Say 100 kgs of rice, what can we do 1 way to do it is that we repeat this process 100 times. So, 100 multiplied by 1 comma 2 and another way is to repeat the second process 100 times.

Fine we will get the 100 kgs of rice, also what we can do that we do the 50 times this process the first process and 50 times the second process fine, or any combination between 0 to 100 that we can take, we can say t times we take first process and 100 minus t times we take the second process, we will get the 100 kg own way. So, on average we are saying this is what it is not always true, but I am saying on average, what we can do is that we can produce 1 kg of rice here, using t by 100 and 1 minus t by 100, 2 comma 1. And we can define this t as we can say that instead of using t here let us use t dash, this is t dash this is t dash.

So, now I can define the t dash by 100 is equal to t. So, 1 kg of rice can be produced by t 1 comma 2 plus 1 minus t 2 comma 1, and this is what additivity is if this is possible, then we say that technology exhibits additivity. Another related, but it may sound different let us say, if it is technologically feasible to produce let us say y amount of output.

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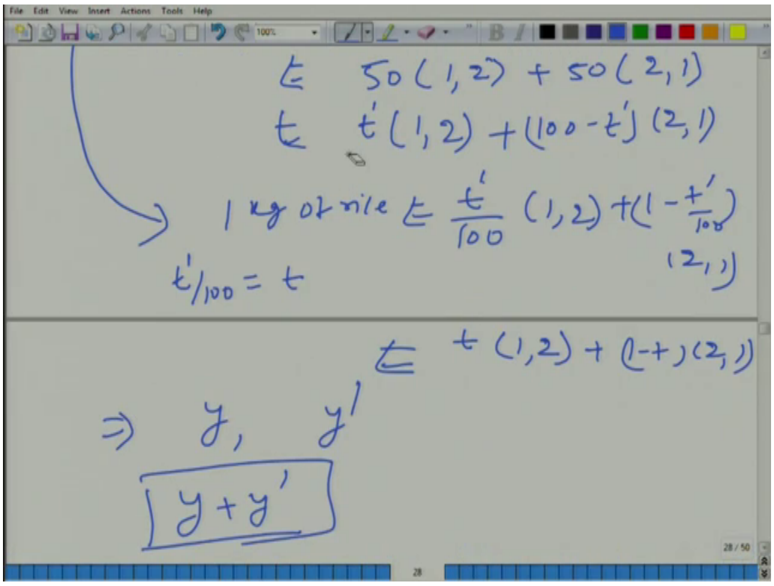

And it is also technologically possible to produce y 1 amount of output, then y plus y 1 y dash amount of output is technologically feasible, I have made small mistake, mistake that explain convexity rather than additivity [FL] a we wills. This is example of convexity; let us talk about additivity first. What is additivity?

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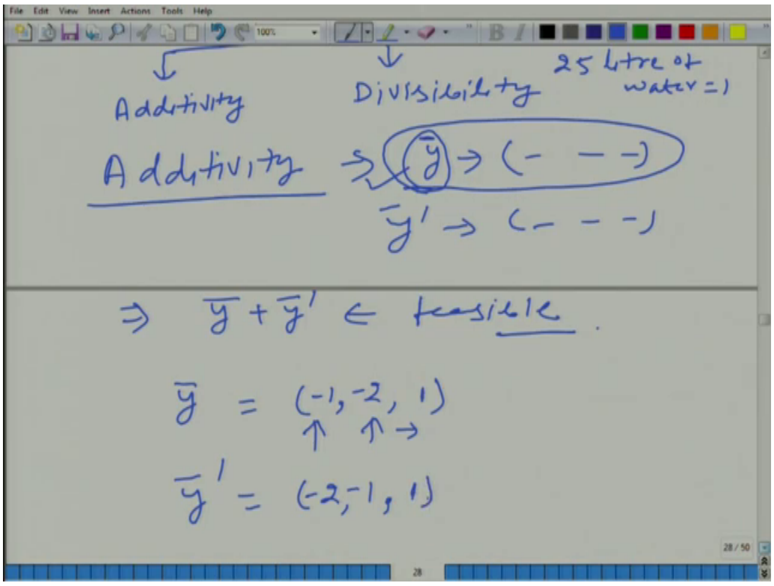

Let us say that a production plan is let us talk in sense of first production set, if there is a production plan y what does this production plan y means, that it gives certain combination of input and output that is feasible, not just this y does not represent just amount of output. If you want to distinguish you can say y hat to represent that, this is a raptor or this is a combination of input and output and, there is another production plan y dash ok. So, y bar and y bar dash both are feasible, then what additivity says that y bar plus y bar hat is also feasible is it clear, how we can explain it if it is possible to produce it is possible to have this production plan.

Let us say let us take an example y bar is nothing, but 1 2 minus 1 minus 2 comma 1 what it means, that we are using 1 unit of input 1 and 2 units of input 2 and we are getting 1 unit of output. Now y bar hat is let say 2 comma 1, then what it means here is that here now we are using 2 units of input 1 one unit of input 2 and it leads to it gives us 1 unit of output.

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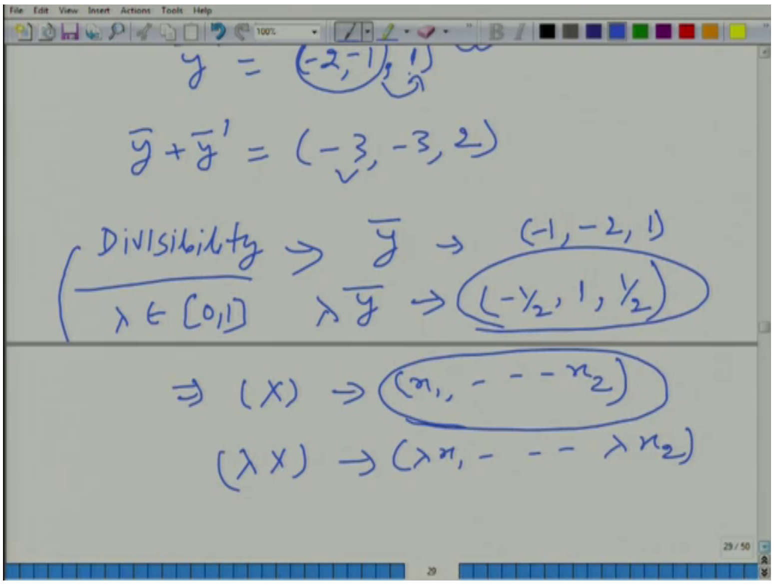

Then this is also technologically possible, that we use 3 units of both the inputs 1 and 2 and we get then 2 units of output. And what is the logic why we are saying it? Because if it is possible to produce 1 unit of output using, this particular combination of input and then again it is feasible to produce 1 unit of output by using this new combination, then of course we do these process once 1 by 1 and we will get 2 units of output.

And in the process we will use 3 units of both the inputs. So, again we are talking about feasibility, we are again talking about feasibility fine, in other word now let us come to divisibility. What is divisibility? If y bar is feasible production plan if y bar is a feasible production plan, it means let us say this take one example, minus 1 minus 2 and 1 if this is a feasible production plan, then lambda y bar is also a feasible production plan.

Let means what we can do where lambda is of course, between 0 and 1 what it means is that we can use minus let us say lambda is equal to half, then we can use minus half we can use half unit of input 1, 1 unit of input 2 and then we get half unit of output. So, what we are saying is that a production process cannot can be miniaturized ok, a production process can be synched fine at this level it sounds very you know it may not be possible sometime, but if we are talking about really large scale, then what we are saying that if we decrease all the inputs in the same proportion, then output will also decrease in the same proportion and this is possible this is feasible fine ok.

It is clear ok. The easier is easier way easier although they these two are not same, but the similar 1 implies the other, but not the other way around, what we have is we can say it input combination x of course, if we are talking about input combination then we do not need to put negative sign its automatically we can say, all are negative because all are input. If this is the input combination and it is feasible to combine them, in this way and get some output, then also it is also possible to combine lambda x 1 to lambda x 2 of course, here we are not talking about the amount of output, but here we are not concerned about the amount of output, what we are concerned about it whether it is feasible to combine the inputs in such a manner or not ok.

When it is possible then we say that technology exhibits divisibility, or production set or technology is divisibility in each other fine. Now we combine these 2 both, if both of these properties are satisfied, then we say the technology is convex and what it means. So, let us look at it.

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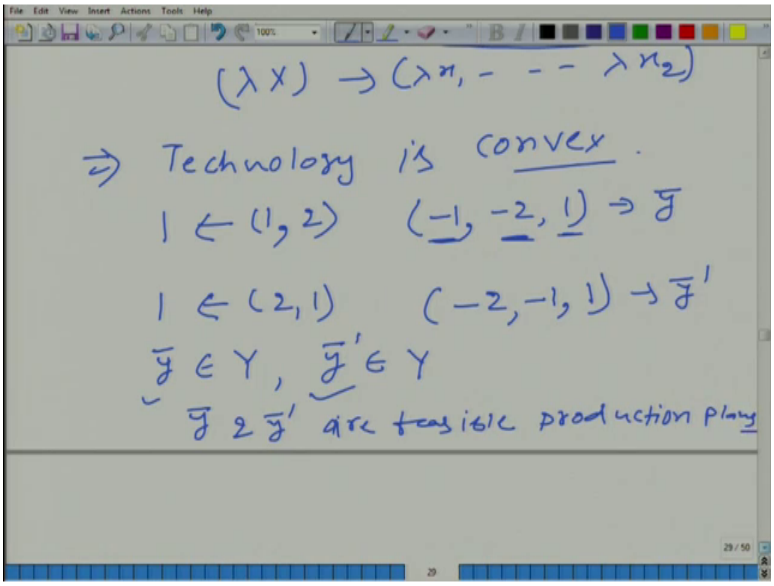

What it means? We have taken example where 1 unit of output can be produced using 1 unit of input 1 and 2 unit of input 2, we have used different symbols there what we have used minus 1 minus 2 comma 1, saying that these 2 are for inputs and this for output. And similarly what we have discussed that this is also feasible.

Then convexity says that there let us say this is y bar and this is y bar dash, then or in other word if it is possible then y bar is an element in the production set, I am just rewriting it and production set we denoted by capital y fine sorry, this will be these both are feasible production plan that is what I am saying, that y bar and y bar dash are feasible production plan.

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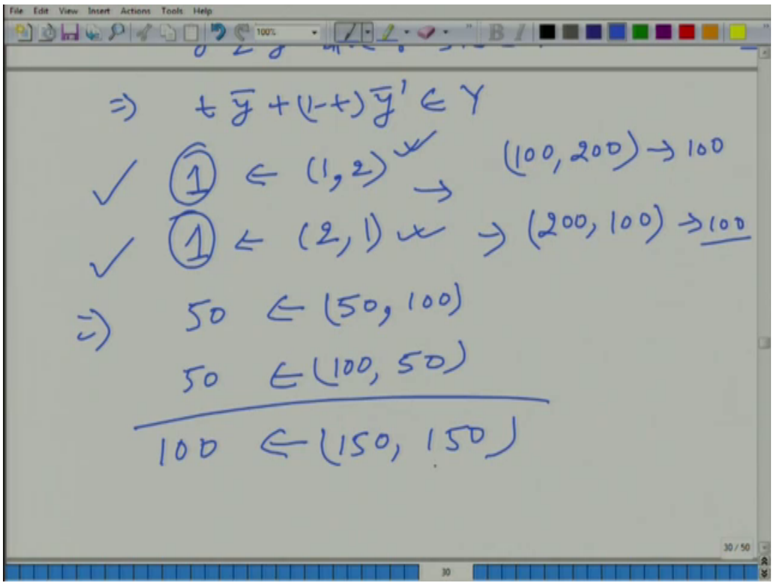

So, then what it means further if it exhibits convexity then t y bar and 1 minus t y bar dash is also feasible and, how we can do it what is the logic, we can say let us say we take that 1 unit of output can be produced choosing 1 unit of input 1 and 2 units of input 2. And next the production process says that seem 1 unit of output can be produced ba using 2 units of input 1 and 1 unit of input 2. Now let us say we just do not want to produce 1 unit we want to produce 100 units. So, 100 units we can produce by replicating this process 100 times. So, what we can do by using 100 units of input 1 and, 200 units of input 2 and we will get 1 unit of output 100 units of output.

Similarly, we can repeat this process 100 times and, in that case we will use 200 units of input 1 and 100 units of input 2 and what we will get both will give us 100 units of output. The other way we can do it that we can combine it let us say 50 times process 1 and 50 times process 2, and what we will have that we will get 50 units of output using 50 units of input 1 and 100 units of input 2. And again 50 times we will use the second process and here, we will use the 100 units of input 1 and 50 units of input 2, if we add these 2 up we will get 100 units of output ok. And what we are using basically 150 units of both the input.

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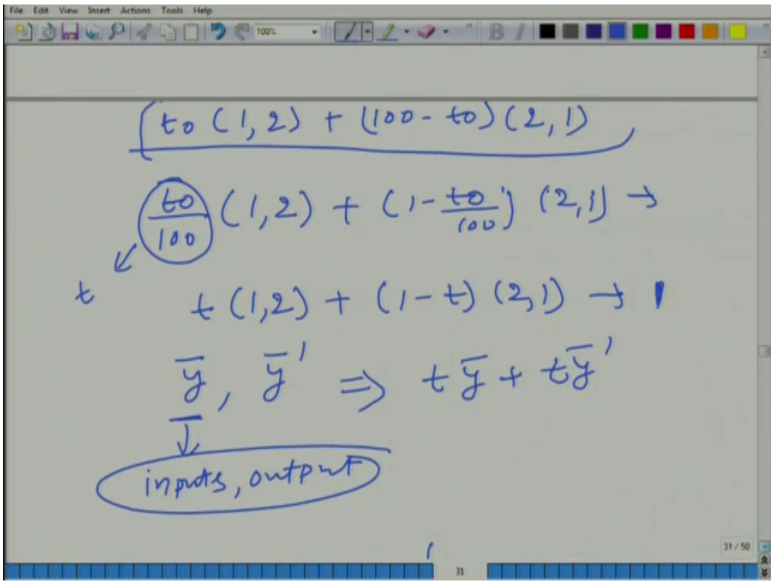

So, instead of doing it for each number what we can do that we can take this process let us say t naught time and this process 100 minus t naught times. What we will get? We will get 100 units of output and what is happening there, we can say 100 units of output we can obtain using t naught 1 comma 2 plus 100 minus t naught 2 comma 1 and this is where additivity kicks in we are able to add these to up.

Now we will use the divisibility property, we will say that on average if we are using you know 100 times like this on average we want to produce 1 kg and divisibility is allowed, then what will happened if it divide it by 100 what we get t naught by 100, 1 comma 2 and 1 minus t naught by 100 2 comma 1. And this will give us 1 kg or 1 unit of output. And if we define this t naught by 100 using say that t naught by 100 rather than using 100 we say it is t.

So, basically t 1 comma 2 1 minus t 2 comma 1 will give us again 1 unit of output. So, what we are saying basically that ok, we start with y bar and y bar dash then if these 2 are feasible, then t y bar plus t y bar dash is also feasible here, y is taking care of not only inputs but also output. The combination is all given here and this exhibits on wig city is it clear.