Social Network
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Rich Get Richer Phenomenon – 2
Lecture - 142
Analyzing basic reproductive number – 5

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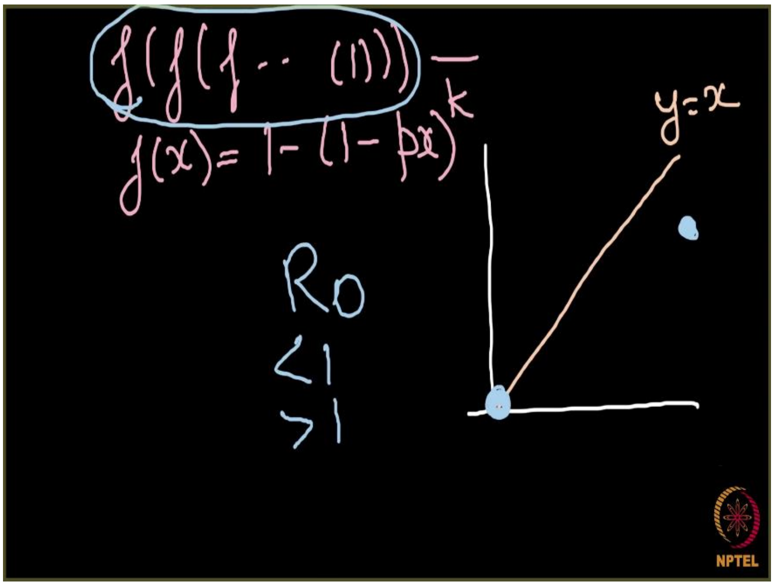

Now, coming to the final part of this theorem proving; what we were doing, our aim was to find f(f(f(…..(1))), where f(x) was a function which was $(1 – (1 – px)^k)$ and we have looked at this function. So, I will just roughly make it here. So, we have looked at this function, if these are our axis and let us say this is not this let us say, this is our line y = x we saw that the first point of this function was here at origin.

And, second point was something which is less than 1 and then when we saw that the slope of this function at this origin is nothing, but a ray basic reproductive number R0. Now, let us see how we are going to find out this value of q* which is f(f(f(…...(1))), when our R0 < 1 and when our R0 > 1 ok.

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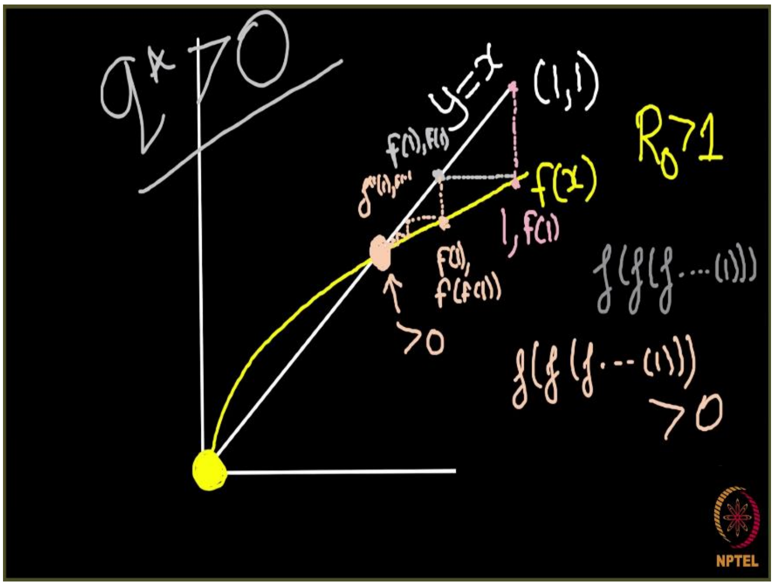

So, let me draw the graph neatly here. This is the graphs and say this is the line, which is y, this is the line y = x and let us say this is the point. What will this point be? (1, 1) and for our function we know that 1 point is here and then 1 point is somewhere here, which is less than 1. And, then let us look at the first case. Let us say the value of R0 > 1, when the value of R0 > 1 we know that our function its slope is going to be greater than 1. So, this line y = x is corresponding to the slope equals to 1. So, slope greater than 1 will go something like this. So, I draw something like this.

So, our function look something like this ok. So, this is our function and I write that this function is my f(x) and you see what is my aim, my aim is to find f(f(f(…..(1))); let us see how do we do it. So, I just make a little bit change to this figure ok, I want some shell points over here yes. This is the point (1, 1), now see something interesting is going to happen. I know that this point over here is (1, 1) right, let us say I draw a line vertically here. I draw a line vertical here, what do you think is this point over here. So, you see the value of x axis remains the same which is 1 and what is the value of y axis over here, this is the function y equals to f(x). So, the value of y over here is f(1) is not it. So, this is this point is (1, f(1)) ok. Now, let me draw a line horizontally over here. When I draw a line horizontally over here, what do you think is this point over here.

So, this point over here now, you see the value of x changes and what is the value of x becomes; this line is y equals to x. So, the value of x here should becomes x equal to the value of y and what is the value of y? f(1). So, I get a point here f(1) comma f(1). So, far so good and I think that you are now getting an idea what I am doing. We again draw a line vertically over here and what do you think is now this point over here, this point over here. Again, the value of x axis remains the same which was f(1) and what does the y axis becomes, y here is f(x). So, y axis here is f(f(1)).

So, you see how we are moving from 1 to f(1) to f(f(1)) and then I go horizontally over here, and it will be nothing, but $f''(1)$, $f''(1)$. And, then I can come here, and it will be up triple dash of 1 and when I do keep doing it infinite times, what will happen, when will it converge. And, see what will happen at this point now, at this point both of these curves meet right. So, when I am going to do these process infinite times this process will converge here because, after this I cannot draw horizontally or vertically because, both of the curves have met. So, when I do these infinite times I converge at a point and you see what this point is.

This point is greater than 0, which means that your f(f(f(…...(1))) turns out to be greater than 0 which means that the value of q* in this case is greater than 0. So, we are done with the first part, what happens when R0 > 1. What happens when R0 is less than 1, is entirely the same completely similar.

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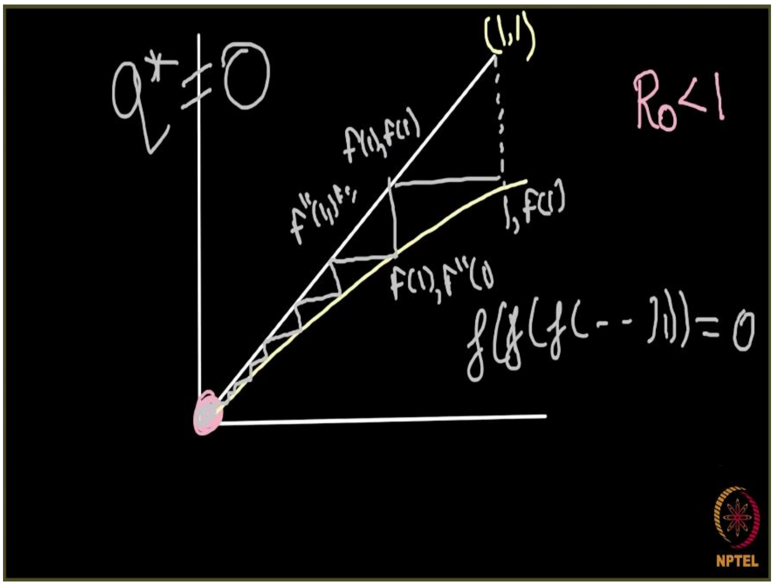

So, again here was our curve and here was the line let us say y = x and then 1 point of our plot was here and another point of our plot was here. And, we know here R0 < 1, if R0 <

1 how will my curve look like. It will go something like this, right something like this. And now I can repeat the same procedure. So, we can repeat the same procedure.

This point here is (1, 1) right, now again drop this here and I get, do I get (1, f(1)) and then I go horizontally here, and I get (f(1), f(1)). And, then I come here, and I get (f(1), $f''(1)$) and then I go here I get $(f''(1), f''(1))$ and I keep doing. So, where is this curve going to converge is at 0. So, when you do it infinite times the curve converges at 0. So, in this case f(f(f(f(f(f(1)))))) turns out to be 0, which means that in this case q* = 0.