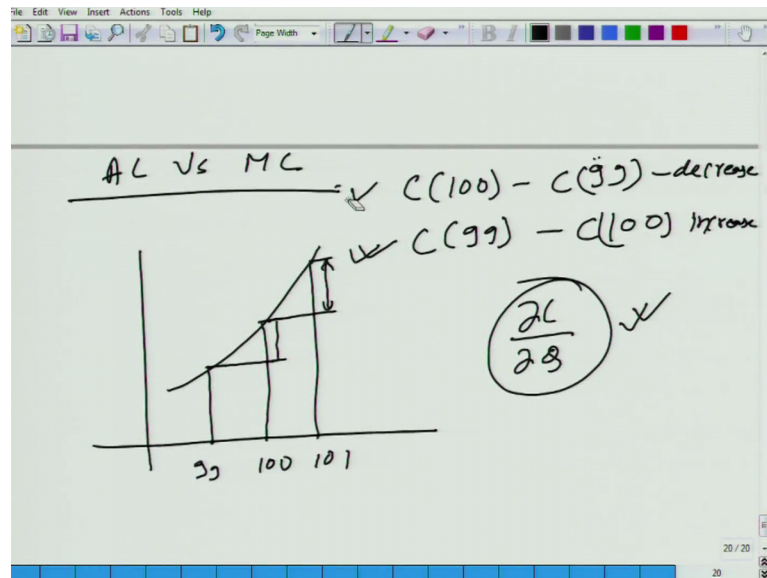**An Introduction to Microeconomics**
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Lecture - 108
Short Run Marginal Cost Vs Long Run Marginal Cost

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We were talking about average cost and marginal cost. Immediately, I will come to the short run and long run, but just to look at it how these two are related we have already studied. What did we study?

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This is what we have studied fine or in other word other way to look at it, if MC is greater than AC if marginal cost is more than average cost; it means you are adding one more unit and the cost of production is going up by more than the average cost. So, that will of course, bring the average cost up. So, in that case average cost will increase ok.

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Of course, this you can look get from here too similarly, if marginal cost is less than average cost what is happening it will drag down the average cost and average cost will decrease. Similarly if marginal cost is equal to average cost it will remain same just reminder no change just to remind you.

Further if we look it from the discrete world let us just let me just write it that MC 1 that is marginal cost to produce the first unit that is the way I am defining it will be equal to total cost to produce 1 unit minus total cost to produce 0 units that is the way we have defined.

What can we write here what is the total cost to produce 1 unit total cost we can divide it into 2 part fixed cost plus variable cost of producing 1 unit. And again here also we can do the same thing fixed cost and variable cost is going to be 0 because there is no output so if this will get cancelled. So, marginal cost to produce first unit is same as the variable cost to produce the first unit, fine.

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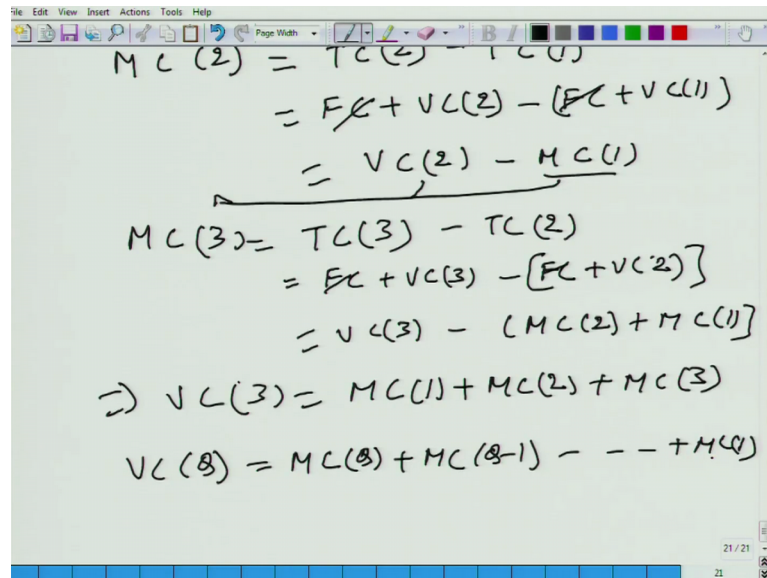
Let us go little further; what happens? let us see. what about the marginal cost to produce the second unit total cost to produce the second unit minus total cost to produce the first unit, fine. What we can write again this is equal to FC plus variable cost to produce 2 units minus this is going to be again fixed cost plus variable cost to produce 1 units. This will get cancelled again, fine and VC 2 minus VC 1 and what is VC 1? VC 1 is MC 1

Now, let us proceed little further MC 3 what is it equal to TC of 3 total cost of producing 3 units minus total cost of producing 2 units. Again remember, I have defined marginal cost in one particular way one can define it as marginal cost at level 0 also. This is just the definition, but roughly it would the idea would remain the same.

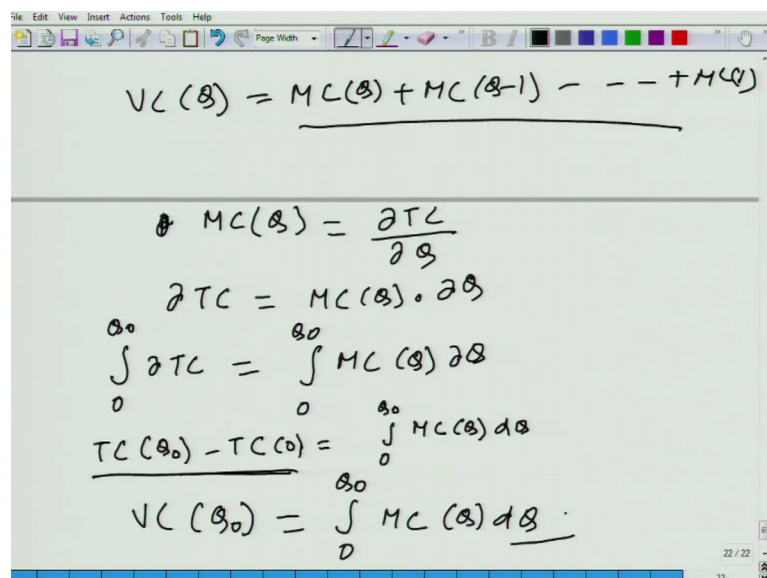And what we will get here and what is this equal to FC, FC will again get cancelled. And VC 3 minus what is VC 2 VC 2 can be given. If we take this MC 1 in this direction VC 2, is equal to basically MC 2 plus MC 1.

And here from here we can figure out VC 3 is MC 1, plus MC 2 plus MC 3, or in other word VC Q if we just continue doing this what we will get VC Q is equal to MC Q plus MC Q minus 1 until MC 1 fine that is in the discrete world. Now, let us look at it the calculus definition.

What is what is MC? MC at Q this is the rate of change in total cost with respect to quantity fine or we can write it the differential change in total cost is marginal cost as Q multiplied by del Q. If we integrate it from 0 to some output Q naught let us say 0 to some output Q naught. What we will get here TC Q naught minus TC 0 and what we will get here. What we will get here the integration of MC Q [FL] fine ok.

What is this think about it? What is this no do not look at this side just explain this. What is this left-hand side variable cost of producing Q naught this is variable cost of producing Q naught. What is this equal to 0 to Q naught MC Q dq look at these two definition they are very similar are not they? Here we are using summation here you are using integral fine ok.

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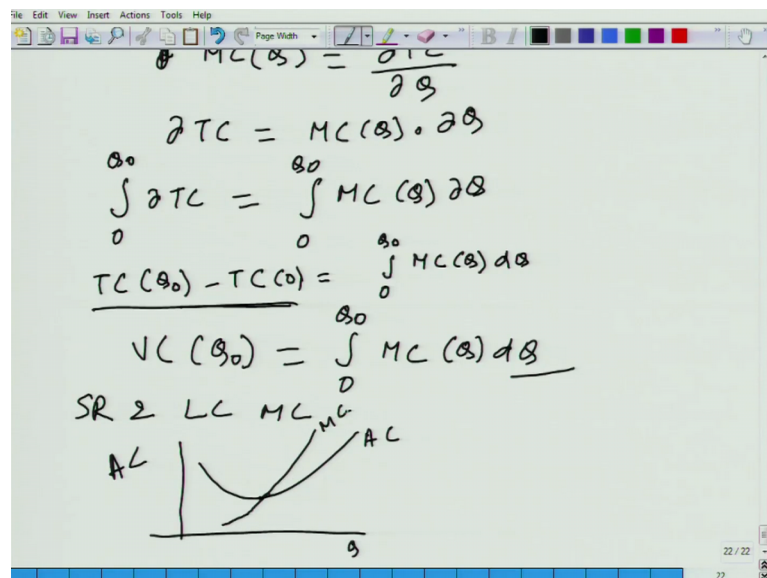
Now, let us come to short run and long run marginal cost. What we have figured out if you remember from the earlier class this was a digression we have if you remember from the earlier class.

If we draw the average cost does not matter whether in the long run or in the short run. How can we draw the marginal cost curve? Can we draw the marginal cost curve here passing through the minimum, minimum of average cost curve this is average cost this is variable cost is not it fine. No this is marginal cost, sorry, this is marginal cost.

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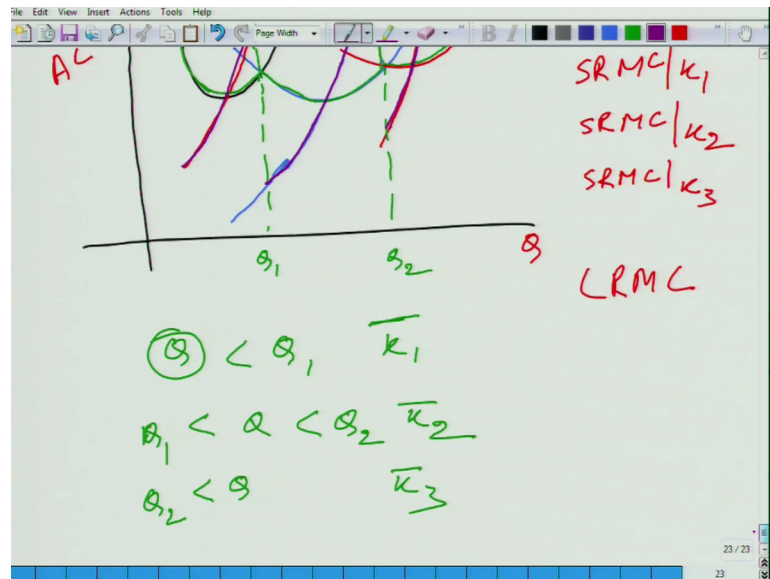
Now, we can bring the earlier graph again earlier graph again let us say again we have 3 different, we can we are fixing capital at 3 different level k 1, k 2, k 3. So, again this graph may not look the same, but the attempt is to draw the same thing things like that a only 3 levels are possible average cost here we have quantity. Let us say, if we draw short run marginal cost curve for k 1 level or let us say for k 1 level, can you tell me how would it look like black color curve passing through the minimum like this ok.

How about if we draw short-run marginal cost curve for k 2 level of capital, same for the blue curve and how about this third, it will be like this is it clear fine. Now can you tell me if I tell you like the earlier case if I tell you that only 3 levels of capital are possible k 1, k 2, k 3.

How would the long-run marginal cost curve look like? Now I am talking about long-run marginal cost curve minimum. So, let me tell you to just to help you the long-run average cost curve will look like this by green color, it will be blue think about it what is happening that if let us say this is the let me say this is Q 1, this is Q 2.

So, what is happening in the long run? If this producer wants to produce Q amount of output and if Q is less than Q 1 he will be using this part he will be using in the long run k 1 bar amount of capital. If Q is more than Q 1, but less than Q 2 this producer will be using k 2 bar amount of capital and similarly if Q is greater than Q 2 then he will be using k bar 3 amount of capital.

So, look at it very clearly it says that here this producer in the long run is following this graph. So, till this point if I am allowed to extend like this so till this point till Q 1 the marginal long-run marginal cost curve is this.

Now of course, I did not draw it so let me extend it like this. Let us say this is the same curve from Q 1 level to Q 2 level let me extend it further. It will be broken in the after in this level it is going to be like this and beyond this Q 2 point the long-run marginal cost curve will be this fine.

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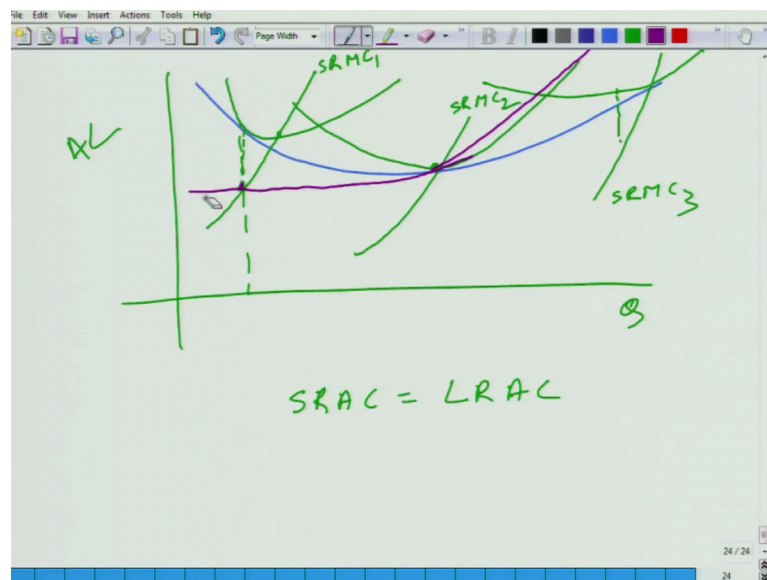
Now, here in this case I restricted the level of capital at either k 1, k 2, k 3. Now let us say in the long run this producer is allowed to vary the amount of capital the way he wants. So, of course the better idea would be to draw all the short run average cost curve first and then the long-run average cost, but we know the concepts I am going to do in the opposite way just because it is easier to draw ok.

So, let me draw again; this is the minimum, this is the minimum, and this is the minimum fine is it clear. Now this is short run marginal cost 1, short run marginal cost 2, short run marginal cost 3, here we have quantity here we have average cost. So, how would the long-run marginal cost curve look like first thing you should know that long run marginal cost curve will pass should pass through the minimum of long run average cost curve.

So, let us say this is the minimum so it should pass through here it comes from below and its it will be a continuous curve because here we are allowed to vary capital the way we want. But what we know that at this point at this level of output because remember at this level of output what is happening what do we have SRAC is same as LRAC fine.

So, at this level the marginal cost will be the same. So, what we know here let me draw it then I will explain something like this. Why at this point it has to be equal we know it will pass through this bottom point and it is increasing this is the way we have been drawing fine any question about this.

Student: Before that point why to the straight.

It is not a straight, it is not straight, it is just my drawing it will be like this, it can be like this again it is just my poor drawing. So, all these graphs are going to be replaced later anyway fine is it clear fine. So, that brings an into the discussion on long-run average cost, long-run marginal cost, short run average cost, short run marginal cost curve fine ok.