Foundation Course in Managerial Economics
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Lecture - 21
Perfect Competition and Profit Maximization

Welcome back to our next part of our discussion on perfect competition. We introduced the market structure in the previous module and we discussed about where the price comes from in case of perfect competition, where does the price taker take his price from and we discussed that basically for every individual firm the individual firm faces a horizontal demand curve at the level of price that is prevalent in the market. So we started of with that and our assumption is the firm is trying to maximize its profit. It has taken its price. Now the last part of the entire puzzle is the firm has to decide what level of output to produce.

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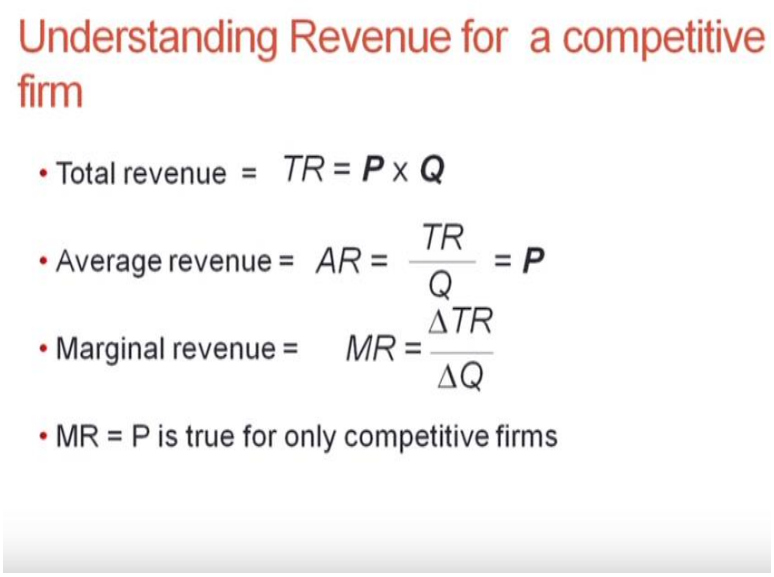

Now before we discuss about the level of output etc. and talk about profit maximization, let us understand how does the revenue look for revenue look like for a competitive firm. So to understanding revenue for a competitive firm now total revenue is equal to price multiplied by the quantity. Now here the P is given. P is a P star. It is given from the market intersection of demand and supply in the market.

So the average revenue is total revenue divided by the amount of output produced. So that is PQ divided by Q and that is equal to P. So average revenue is equal to the price that is given in the market.

How much is marginal revenue? Marginal revenue is basically it is differentiation of the total revenue divided by the marginal amount of outputs. Basically marginal revenue means that when the firm is selling a additional unit of output how much additional amount of revenue the firm is receiving. That is the marginal revenue.

But in case of a perfectly competitive firm since the price for every individual unit it does not change it is given by the market and the price remains the same so for the competitive firm marginal revenue that is del TR divided by del Q is equal to the price in the market. So this is true for only competitive firms.

This is true for only competitive firms because in other kinds of market structures we are going to see that the price changes with different levels of output. The price changes with different levels of output and we are going to discuss about them in details later. Let me not get into those market structures right away.

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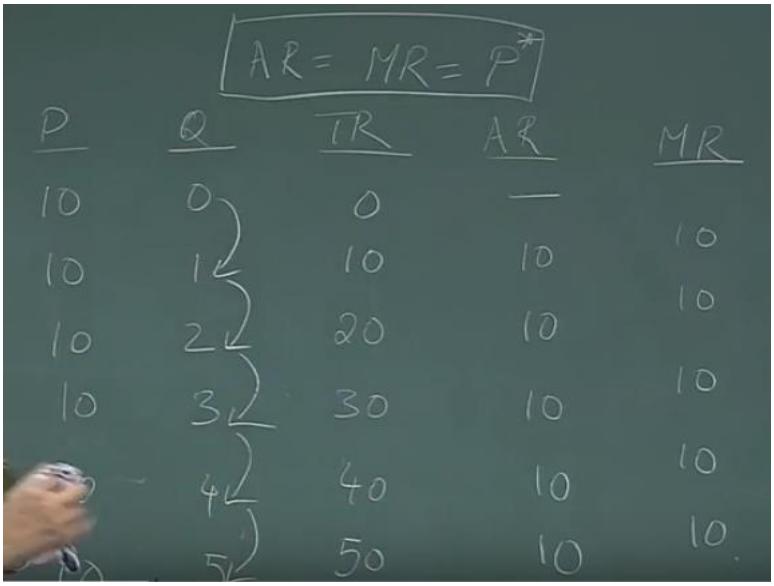

So this is our understanding of revenue for a competitive firm and to elaborate this more with an example let me take a very simple example where we have the price is given. So the price is always say 10 Rs. So the price is always say 10 Rs because the firm is facing a horizontal demand curve. So no matter how many units of output it sells or decides to sell the price is

always going to be 10 Rs. So Q is 0, 1, 2, 3, 4, or 5 price is always 10. How much is total revenue? Total revenue is price multiplied by quantity. So it is 0, 10, 20, 30, 40, and 50. How much is average revenue? Average revenue is always 10. Average revenue is always 10. What about marginal revenue. Marginal revenue is basically every single so additional amount of output that I am selling the next marginal unit of output here I am selling 1 unit I am getting 10 Rs. Another additional unit I sell I get again 10 Rs. Another unit I sell again I get 10 Rs. So my marginal revenue in all these situations is 10.

So we can see that in case of a perfect competitive firm average revenue is equal to marginal revenue is equal to price. So this holds true for only a competitive firm. So this holds true for only a competitive firm. So let me clean this up. Okay so moving on.

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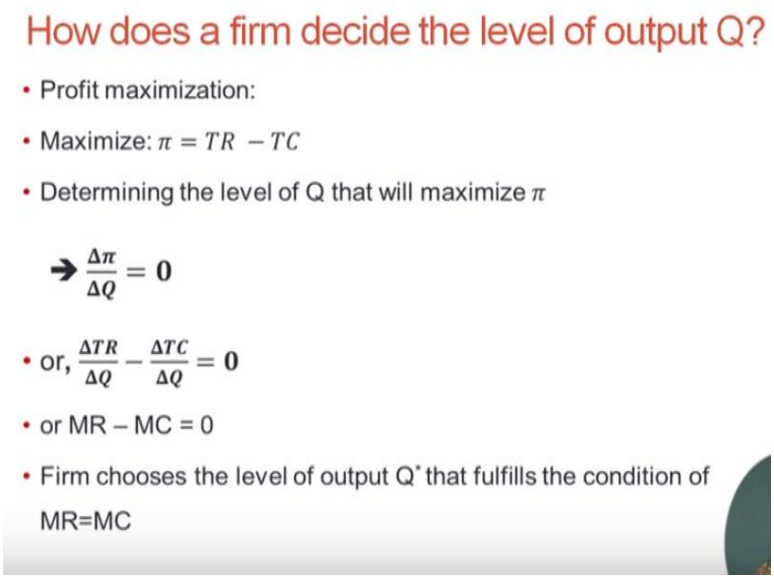

Now, now that we know what the revenues the different forms of the revenue looks like now that we know that price is given we know about the cost curves of the firms now how does the firm decide the level of output. How does it decide how much output to produce? So for this the firm is going to our assumption is the firm is maximizing profit.

So as is shown in the slide so pi is our typical symbol for profit which we are going to use during the entire course and pi is equal to total revenue - total cost. So determining the level of output that will maximize pi. So we would like to determine that level of output which is going to maximize profit and so that is by the first order condition for maximization. It implies that del pi

del Q is equal to 0 that is del TR del Q minus del TC del Q is equal to 0 or marginal revenue - marginal cost equals 0.

So the firm chooses the level of output Q star that fulfills the condition of marginal revenue equals marginal cost. Now marginal revenue equal marginal cost equals marginal cost is the profit maximizes profit maximizing condition for any firm. Profit maximization maximizing condition for any firm is that, that the additional revenue that the firm expects to receive from selling the last unit of output that should be equal to the cost of producing that additional unit of output.

Now for a perfectly competitive firm let us look at the intuition. Let us look at the profit maximizing condition graphically and see how the output is determined.

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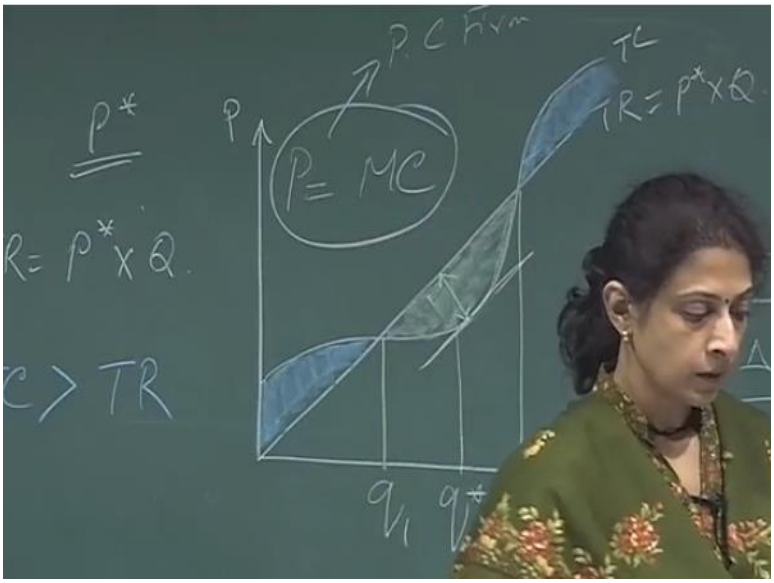

Now we know that price is fixed. So P star is given. So since P star is given, what is my total revenue? My total revenue is equal to P star into Q. So total revenue is P star into Q. So the total revenue curve will be a straight line through origin where slope is P star. So this is the total revenue curve.

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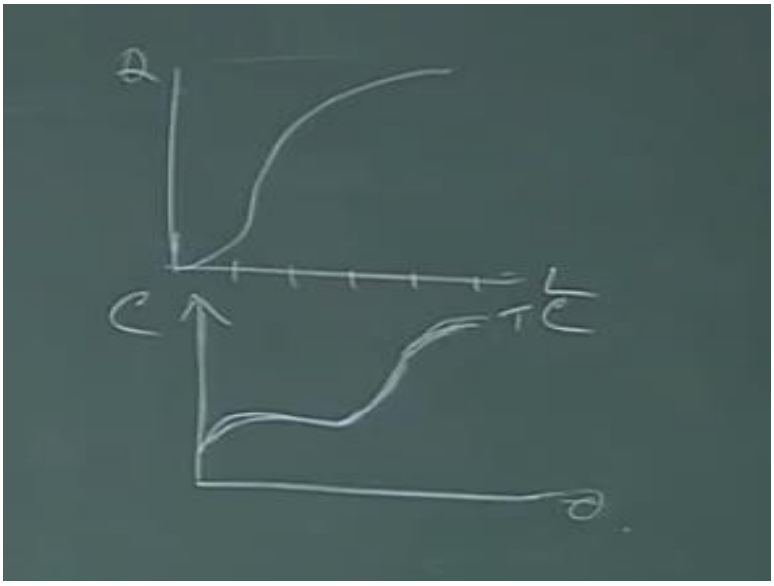

Now what does my total cost curve look like. So you may remember that when we were discussing about costs we developed the cost curve from the production function. If you remember this is the production function that we drew. Then we flipped the production function and this is the reason that we flipped the production function to translate it into the cost curve and see and put the cost curve in this kind of framework to understand the difference between revenue and cost so this is what we did and our cost curve after including the fixed cost it looked something like this. So this was my cost curve.

This is how my total cost curve looked like. So if you may remember we had labour here the variable cost and we had the output here Q. So we translated the labour into the monetary units of the wages that is the cost and basically we flipped the curve so that we had cost here and we had output here.

So if you can recollect this cost curve then basically for this firm we are going to draw the cost curve here. So this is assuming it is it fixed cost so the cost curve looks something like this. So the cost curve looks something like this total cost curve and so this is the cost curve. What do we have over here, in the blue region? What do we have in the blue region here and over here?

What we have in this blue region is that total cost is more than total revenue in these regions. So total cost being more than total revenue implies that the firm is incurring losses because its cost is more than its revenue. So this is the region where it is incurring losses and where is it incurring profit? It is incurring profit in this region the green region. So it is incurring profit in the green region. So that basically means that in the range from q 1 to q 2 the firm is incurring profit and

the firm can very well operate or produce any amount in this range. So if the firm produces any amount in this range it is going to incur a profit.

But what amount is going to maximize its profit. What amount is going to maximize its profit? The amount that is going to maximize its profit is the region where the distance between the revenue and the cost curve is maximum. So this is the so where total revenue minus total cost is maximum that is where that level of output should be the profit maximizing output level of the firm. So this is so this gap is maximum where the slope of the cost curve the slope of the cost curve the slope of the cost curve equals the slope of the revenue curve and that is nothing but the first order condition of maximization.

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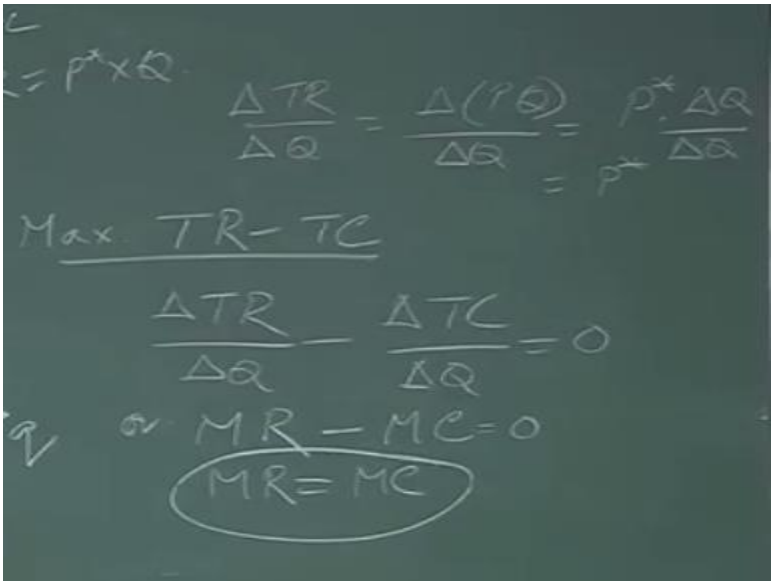

So when we maximize this our del TR del Q minus del TC del Q is equal to 0 or so del TR del Q is nothing but the slope of the revenue curve and del TC del Q is nothing but the slope of the cost curve and the slope is called the marginal revenue minus marginal cost. This is equal to 0. So marginal revenue equals marginal cost is my profit maximizing condition. So this is my profit maximizing condition and this happens at this region. So at this region my the difference between the 2 is maximum and marginal revenue equals marginal cost.

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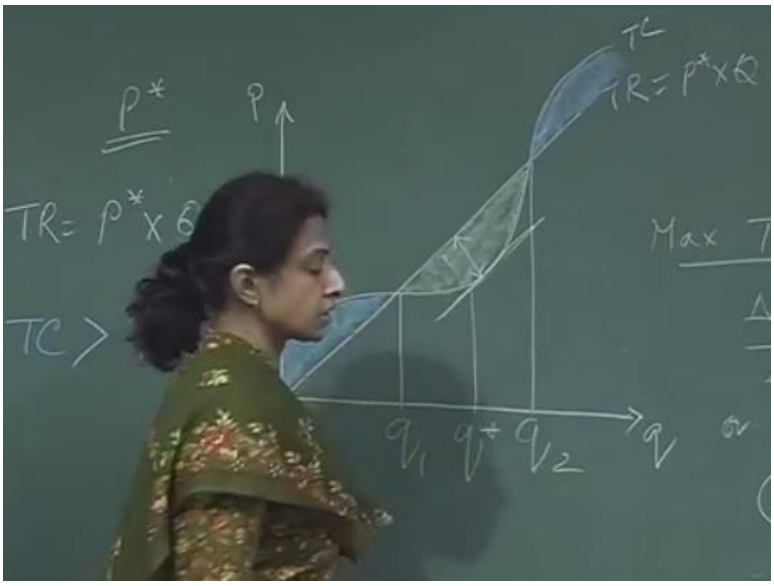

Marginal revenue as we saw from the previous slide that this is the definition of marginal revenue and so this is the level at which the firm should basically produce. So it is going to the firm is going to produce the output Q star which is going to maximize marginal revenue and the difference between marginal revenue and marginal cost.

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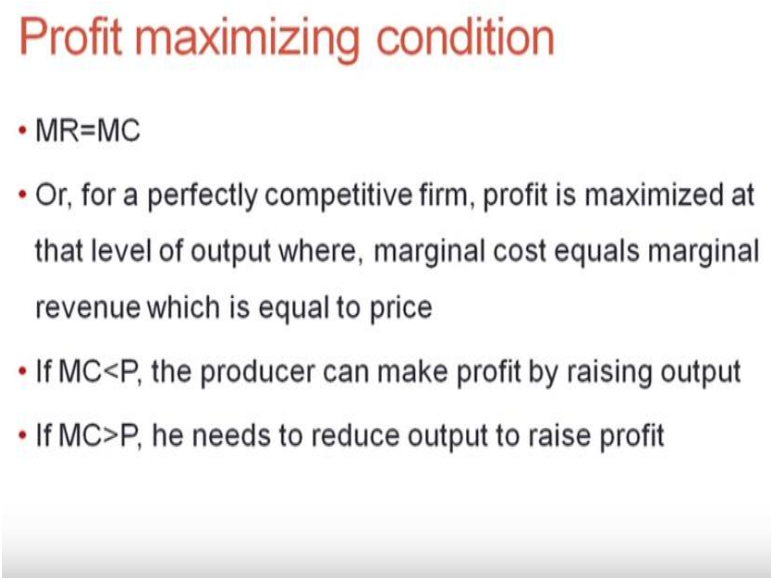

So coming back to the profit maximizing condition, so profit maximizing condition is marginal revenue equals marginal cost or for a perfectly competitive firm profit is maximized at that level of output where marginal cost equals marginal revenue which is equal to price. Now coming back to this graph now what is the slope of the total revenue or what is this marginal revenue.

This marginal revenue or del TR del Q is nothing but del TR del Q is equal to del PQ del Q since P is constant at P star so this is P star into del Q is equal to P star.

So for a perfectly competitive firm the profit maximizing condition is the price should be equal to the marginal cost. This is for only the perfectly competitive firm. So price equals marginal cost. Now what happens if price is more than the marginal cost? Let me clean this clean the board and show you a more familiar diagram that you are going to see in all your text books how profit is determined and how can we quantify the profit, the revenue and the cost. I am going to draw that diagram.

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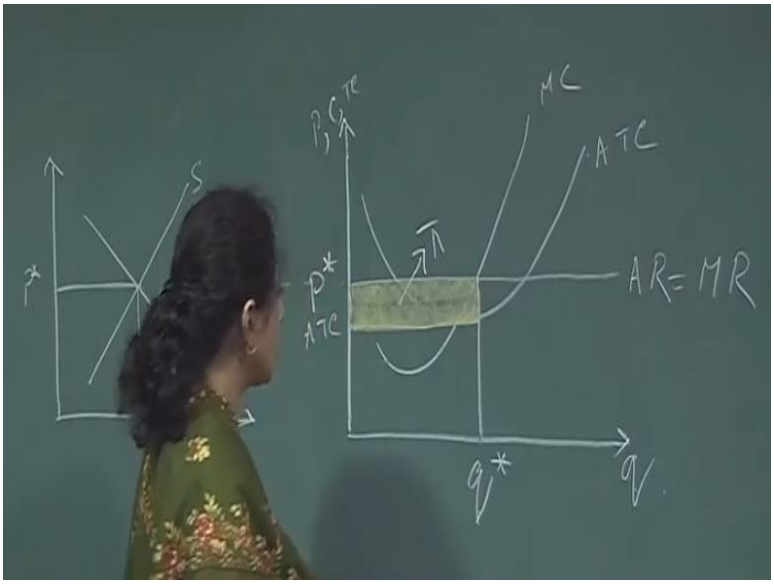

So coming back to the this is the market demand and supply. This determines the price P star and the firm is basically so in this diagram we are going to draw all the revenue, price, cost, all the curves. So I am writing here P, C, R etc. So on the X axis you always have the quantity. It is rather the small q. This if for the firm and since the P is given so we draw the price line first. So we draw the price line first. So this is P star and as we have seen from our understanding of the revenue so P star is equal to average revenue curve this is also your marginal revenue curve.

This is not only the price line this is the demand line that the firm is facing. This is the average revenue line of the firm and this is also the marginal revenue line of the firm. Now our profit maximizing condition we have already understood it is clear that profit maximizing condition is marginal revenue equals marginal cost.

So let us draw our very familiar marginal cost curve here. Now this is the marginal cost curve. This is our marginal cost curve. So profit maximizing condition says that the intersection between where the point where MR is equal to MC that level of output should be profit maximizing. So basically the firm is producing the firm should produce q star. Q star is going to maximize its profit. So does our problem end there? Does our problem end there?

So we have determined price. We have determined quantity and we know about the cost and this is our profit maximizing condition. So is it that our problem ends here? No. because we need to understand this could be very well our profit maximizing level of output but is it actually giving me any profit or not? That is important to be understood.

So let us draw the average cost curve. So let us draw the unless and until I draw the average cost curve here I will not be able to understand how much cost I am incurring in producing this amount of output. So here my revenue is P into q. My total revenue is this rectangle but what is my cost. For the cost for understanding the total cost I need my average cost curve here. So in the situation that my average cost curve is somewhere here.

If my average cost curve is somewhere here so this is average total cost. So if my average cost curve is somewhere here then at q level of output my total cost is this is my sorry so this is my average cost. So average total cost so average cost multiplied by output this is my actual cost. So the entire rectangle is my total revenue minus the cost minus the cost minus this cost gives me my profit.

So we can very well see that since we can see that since my price line is above my average total cost so this firm is basically managing to get some profit here. So it is basically getting a profit here and this is the profit. So it maximizes its profit and it has a amount of profit, has a positive amount of profit.

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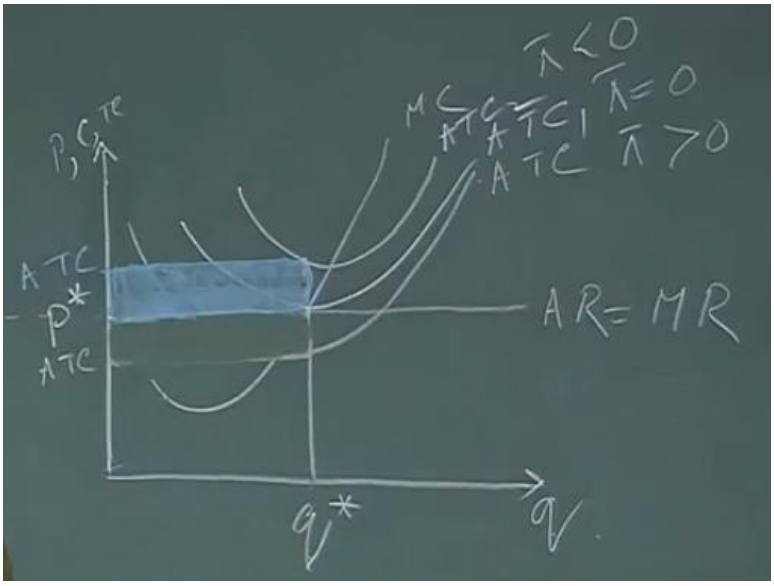

Now what happens if my average cost curve is what happens instead here instead say my average cost curve is here. Say this is my average total cost. If this is my average total cost then also I also you may have noticed that I am trying to draw the average cost in such a way that the marginal cost intersects the average cost at its minimum because this is what we found out when we discussed about the cost curves that the marginal cost intersects the average cost at its minimum.

So that is how I am trying to draw and so when the average cost looks something like this. So this is another average cost. Say this is my average cost. So here my price is equal to my average cost which means my revenue is equal to my cost and here my economic profit is equal to 0. So here my profit is equal to 0. So when in case of ATC 1 so in case of ATC my profit is more than 0. In case of ATC 1 my profit is equal to 0.

Now what happens if my average total cost is somewhere here? It is high up. My average cost is higher than my price. So my average cost is higher than my price say it is ATC 2 so then what is my cost like? So here again this is my output. So at this output level this is my cost this is my at this output this is the cost that I am incurring, average total cost. So average total cost multiplied by my output this is my total cost and this is my revenue the lower box is my sorry this is not the revenue this part is the revenue.

So this is my price line marginal cost and this is my revenue and this is my cost. So my so this part is the this part is the loss that I am incurring so out of this is the so this is the loss that I am incurring because this part the my cost is more than my price. The cost is more than the price that

I can charge in the market so I am incurring a loss over here because the lower part is my this is my revenue. So in case of ATC 2 my profit is sorry this is not, ATC profit is more than 0, ATC 1 profit is equal to 0, ATC 2 profit is less than 0.

So this is how I determine how much profit I am going to so profit maximizing condition does not mean if you are able to determine the profit maximizing level of output the problem does not end there because the profit maximizing level of output may very well give you a loss as we are showing here. So we have to find out by using the average cost curve that actually how much profit or loss the firm is incurring in such a situation. Now what happens let me clean the board again.

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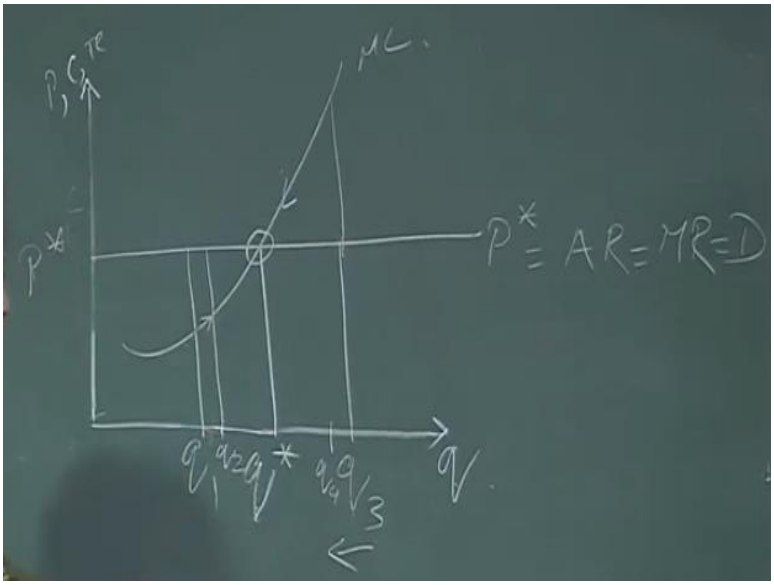

So this is my P star equals revenue is equal to MR is equal to D so everything and this is my marginal cost curve. Now what happens if marginal cost is less than price?. So the produce can make profit by raising output. So what happens if the producer decides that let me produce at a level over here q 1. So what happens at q 1? Now at q 1 marginal cost although it is increasing but still it is much less than the price.

So marginal cost is less than the price. So additional unit of output if the firm is to produce it is going to incur a marginal cost which is much less than the price or the marginal revenue that the firm can expect by selling that unit of good. So it makes sense for the firm to produce that additional unit of output. So here q1 say this is q 1 to q 2.

So these are additional units of output it has to make a decision whether to go to q 2 or not. So obviously although its marginal cost is increasing still it is much less than P so it is going to earn some additional revenue, P is the additional revenue that it is going to get by selling this extra unit of output. So it keeps increasing the output till it reaches q star where its marginal revenue is equal to its marginal cost.

Now beyond q star what happens again beyond q star. Say for example by chance it is operating at this level where it is say q 3. Now here clearly it is incurring a high cost. So if it reduces its output by another unit say here q 4 if it moves this way if it moves this way it is its marginal cost is falling but it is still above the price that it is going to get.

So it keeps on reducing the output till it reaches this point. So till it reaches this point and here it is the marginal cost that it is going to incur by selling another unit of output is going to be the marginal revenue that it is going to get by selling that additional unit of output. So this is the optimum point where the firm it makes sense for the firm to operate. So the so if marginal cost is more than P he needs to reduce output to raise profit and if marginal profit is less than P the producer can make profit by raising output.

So that so this was our discussion about profit maximizing condition about how the firm decides what level of output to produce and will continue this discussion in the next module. Thank you.