IIT Madras

ONLINE DEGREE

Mathematics for Data Science 2
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Week 11 - Tutorial 05

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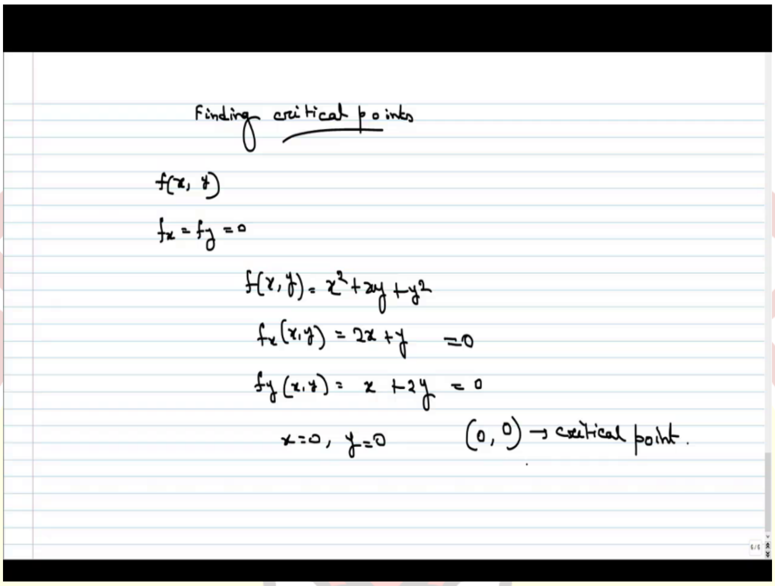

Hello everyone. So, in this video we will try to find out the critical points of the some given function. So, critical points are of a function $f(x, y)$ are the points where the tangent to the surface is basically parallel to the x y plane. So, here we are considering only two variable functions, so the tangent should be parallel to the x y plane. So, that means that f_x and f_y both of these should be 0. So, we will get two equation and all those points which satisfy these two equations simultaneously that will be our critical point.

Let us try to take an example. So, let us take $f(x, y) = x^2 + xy + y^2$. So, I get this function. Now, what is f_x?. So, $f_x(x, y) = 2x + y$, $f_y(x, y) = x + 2y$ if I equate both of them to 0 and if I solve this, I will get there is only a unit point that is $x = 0$ and $y = 0$ that is at the origin. So, this origin is a critical point.

Now, let us try to see the geometric representation of this function and try to find out that whether this point is the maxima-minima or a saddle point. Let us go to Geogebra and find it.

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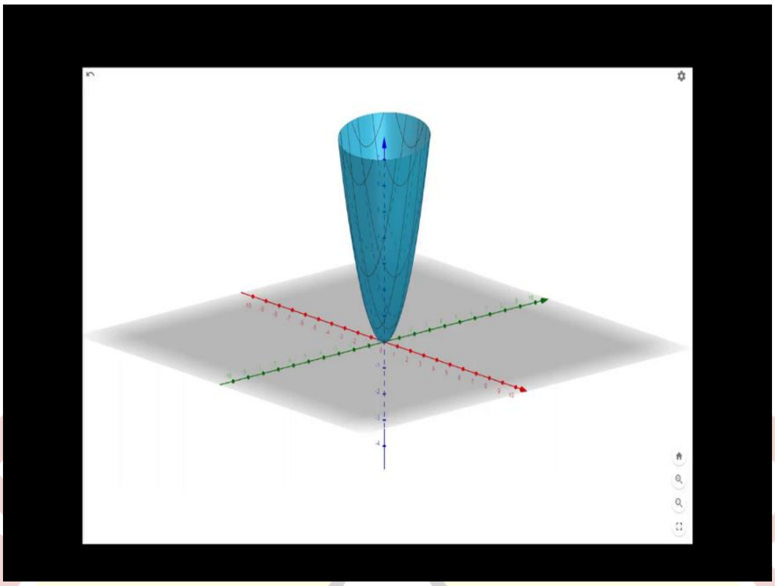

So, the graph of the function $f(x, y) = x^2 + xy + y^2$ will look like this, so you can clearly see that it is passing through origin and it is always a positive counter. So, basically the value of the function here is always positive. So, 0 is the minimum one, at the origin it is attaining the minimum. So, the origin is basically the minima of this function. Thank you.