IIT Madras

ONLINE DEGREE

Mathematics for Data Science 1
Professor. Neelesh S Upadhye
Department of Mathematics
Indian Institute of Technology, Madras
Week - 04
Tutorial - 07

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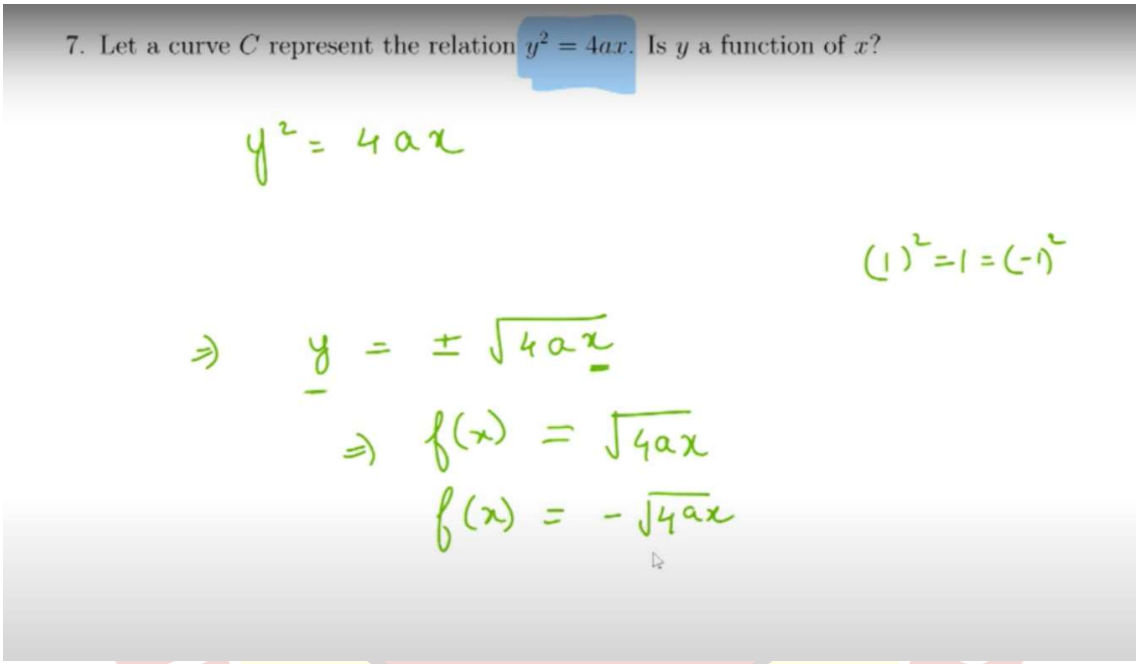

In question number 7, we have one relation given this way, $y^2 = 4ax$. And they are asking a very simple question, is y a function of x. So, we have $y^2 = 4ax$. And the interesting thing about square roots is, if I did the square root of 1, it is not just 1, it is actually ± 1. So, both $(+1)^2 = 1$, which is also equal $(-1)^2$.

So in this case, we need to consider the fact that $y = \pm\sqrt{4ax}$. Which means for the same x, I might have 2 different y's. So, put it this way, I am basically saying f(x) assuming it is a function is equal to $\sqrt{4ax}$ and f(x) is also equal to the $-\sqrt{4ax}$. And this is not allowed, for a single element in the domain, for a function, you should have only one image in the range. But here we have 2 different images for the same element in the domain. Therefore, this is not a function.

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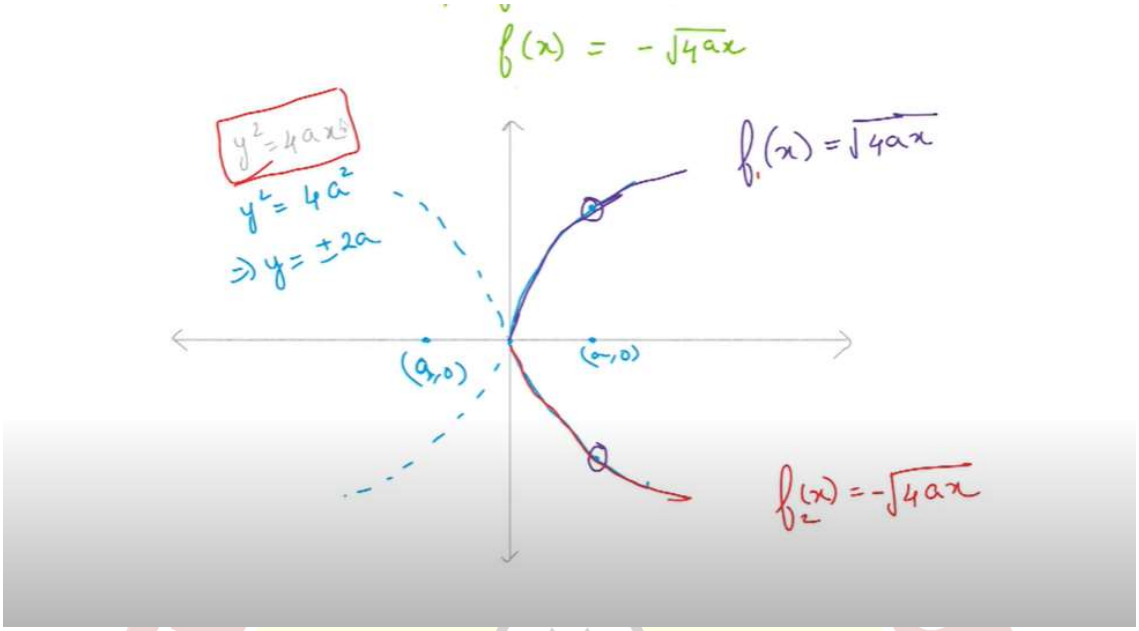

If we looked at it in terms of the plot, we have $y^2 = 4ax$, that is what we are trying to plot. And for x = 0, we get y = 0. So, this curve passes through the origin definitely. And for the next x value, I am going to take a, so therefore, $y^2 = 4a^2$, which gives $y = \pm 2a$. So, if a is positive, this is (a, 0), then 2a is going to be somewhere here like this, and -2a is going to be somewhere here like this.

And so, we have a parabola which goes something like this. And if a were to be negative, then this would have been (a, 0) and we would have a similar parabola in the negative direction. Either way, it is pretty clear that for a given value, you have two corresponding y values, for a given value of x you have two corresponding y values and that is not allowed for a function.

Independently f(x) $= \sqrt{4ax}$, which is this part of the curve, that can be treated as a function and f(x) = $-\sqrt{4ax}$, for convenience let us call this as f_1 and this is f_2. This is also possible to be treated as a function independently, but their combination which gives us this relation, that is not a function.