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SPEAKERS

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In the previous video, you saw how a function was defined. And it was defined, where for each X value, each X value in the in the domain, there is just one Y value in the range. Now to this video, let's talk about a specific type of function. So we're still talking about functions. And we're going to talk about a specific type of function. And that's called a one to one function. You can see on the slide beside me the definition of what a one to one function is. Now, what that's saying, not only does this algebraic expression have one Y value for each X, it also has one X value for each Y. And that's going to be very important in the social sciences when it comes to modeling human behavior, because that's going to allow us to create something called an inverse function. That's where we're going today. That's what this video is about. So let's get started. And let me give you a more detailed image of what these one to one functions look like.

Now a function is going to be a one to one function, if each element in the range corresponds to exactly one element of the domain. So you could read that in front of you. Let me draw a diagram to illustrate, so I'm going to draw this squiggly area here. So we've got an area and it's called the domain. In this domain, there's going to be some value. So maybe we could have a two and a four and a 16. And we're going to have a function mapping. We're gonna have a function map, and that's going to take us from the domain into the range, and can be, you know, any kind of shape, the range could be any kind of shape. And then in there, I guess I need to make this just a little bit longer here. And maybe it's going to map up to say, four. And we might have a four that maps to an eight and a 16, that maps to a 32. Let me make sure we know that this function is mapping from the domain into the range. Now, since each number in the domain has just one value in the range, this must be a function. And because each number in the range has just one value in the domain, this function is one to one, I could just say this function is one to one.

Now, through the magic of technology, I'm going to make this a little bit smaller and move it out of the way. And now I'm going to draw a function for you that is not one to one. So suppose I have my domain. And I've got a two, four, and a 16, like before, and I've got a range over here. We can draw a little space around it. Make sure, I'll just make sure, you know, it kind of looks a little different the

range is a different area than the domain. And suppose I've just got a four and a 32 here. Now if the two maps to four and the four, say, maps to two or excuse me the four maps to four. If the four maps to four, and the 16 maps to 32, then what we have here is, we have a function.

Make sure everyone can see and it's clear a function, we have a function that is not one to one, we have a function that is not one to one. Now it's a function, because each element in the domain maps to, to just one Y value. But we have two X values in the domain that have the same Y value here, they have the same Y value. So this is a function, but it is not a one to one function. Next, let's take a look at a graph of a continuous function. And we'll try and determine if the graphs of these functions are one to one.

Here we have a function, its Y is equal to X to the power of two thirds. Previously, you learned about the vertical line test. And you can see that if I pick any point along the X axis, say here at 30, and I walk up with a vertical line, that vertical line only crosses the function once. So we know this is a function. Now, if I take that away, well, if it's one to one, it means for each Y value, there can be at most one X value. So if I take 10, Y equals 10, and I walk to the right, that horizontal line crosses the function, which is right here, just once. So you can use a H line test, the horizontal line test, to determine if a function, one that's already passed the vertical line test, is a one to one function. And so here since I can't find any Y values that are associated with two X values, I can't draw a horizontal line that crosses the function more than once. This function is yes, it is a one to one function. It's one to one function why? For each Y in the range, there's just one X value. And I don't care about the observations where there are no, where there are no Y values, that doesn't matter one way or the other, I can just ignore them.

Looking at this function, here, you can see it's kind of a, some sort of, well, you can see right here, it's a quadratic, a quadratic function. If I look along the X axis down here, any X axis value I pick, if I draw a vertical line starting from that point, these vertical lines cross the function only once. I can't find any x values where a vertical line starting from that X value is going to cross this function more than once. So this is definitely a function. But is it a one to one function. Let me remove these lines from our graph. And I can pick a spot, let's pick 10. If I draw a horizontal line here, well, the way this is drawn, we're only crossing the function once. So it's tempting to think that this function is one to one. But wait a second, if I pick X equal to 30, and I draw a horizontal line from there, we've got two, one here, and one here. We cross, it crosses. This horizontal line crosses our function twice. And as soon as we have even just one Y value that's associated with two X values, right, the X values are down here. So there's an X here and an X here, both of which map to Y is equal to 30. Therefore, no, this is not one to one. We can show that this is a function that passes the vertical line test, but it fails the horizontal line test. I can draw a horizontal line that will cross this function more than once.