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SPEAKERS

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Now if a function is one to one, it also has an inverse function. I mentioned inverse functions are useful often in social sciences, when we're modeling we like working with the inverse function rather than the function itself. Now what is A inverse function? An inverse function reverses the mapping. So essentially, X values become, oops, become Y values, Y values become X values. Now we have an example here. So here's our function G , it's a discrete function, I've just circled that they're discrete function, rather than a continuous function. Discrete being, you can count the number of ordered pairs. So here we have four ordered pairs 1, 2, 3, 4. The notation for a inverse function is G to the power of negative one, then the notation here can be a little bit tricky. So we've got the inverse of G is what we want to find, and it's denoted as G to the power of negative one, but it's not G to the power of negative one, it's the inverse. So often, we see this, if we have G of X , its inverse is G , with that power, negative one, G of X . So a little confusing, but this is how it's most commonly denoted in the social sciences.

Now, if we want to find G , negative one, and maybe I will add the X just so you can see there that it's not just an unknown variable to the power of negative one, if I want to find the inverse of this thing, I would just flip the X and Y values, so I'm going to have three, negative five, whoops, five, negative two, four and one, negative four and two. So pretty straightforward. Most often, we're going to be working with continuous functions. So flipping the X values and Y values is going to look different. But conceptually, you can think of it similarly to a discrete function.

Let's work through an example together where we have a continuous function, and we're being asked to find the inverse function. So I could also maybe to avoid some confusion, add in a little X there, but I could just leave it in and write it as so. Now, I'll break it down into steps. So if we want to find the inverse function, step one is solve for the exogenous variable. So in this case, we're going to solve for X . So we've got this function H of X , and it's equal to $3X$ plus six. I want to isolate $3X$ on one side of the equation, so I'm going to subtract six by both sides of the equation. And that's just going to give me $3X$ is equal to H of X minus six. And now I can divide both sides of the expression by three. So I'm going to have H of X minus six over three is equal to X . Now there we're done step one. So that's nice

what we've got there, we could think of this as the as an inverse function. If we want to graph the function and the and its inverse function on the in the same space, then we need to move to step two. And we're going to switch the Y and X variables.

Now we have no actual Y variable denoted here. So in this case, it's going to be just H of X, which is all we have, and X. Now let's follow the instruction we've been given. I'm going to scroll the screen down here. So we want to switch our H of X and our X in this expression right here. So what does that look like, that's going to look like X minus six over three is equal to H of X. And that H of X is actually the inverse function. And the original function was H of X is equal to 3X plus six.

I want to show you a special property. So there's a special property or a special relationship between a function and that function's inverse. So let me demonstrate that to you right here. We've got our inverse function, right here, denoted by this negative one, where the exponent would normally be, and we've got the function H of X. Now the special property looks something like this. It says if I have H of, if I have, if I take the inverse function and I plug it into the original function H of X, I'm going to end up with X. Now let me demonstrate using this example what this looks like. So I could write H of X, like so. And then I'm going to write H of H inverse X. And so wherever there's an X, and there's just the one there with the 3X, I'm going to plug in this expression up here, I'm going to plug in the inverse function. So I've got three times X minus six, divided by three plus six.

Next line, we've got 3X minus 18 divided by three, plus six. Well, if I factor out a three from the numerator, I'm going to end up with, I guess I'll do it, I'll do it step by step. And we end up with the threes cancelling each other out. X minus six plus six is just equal to X. And so you can see using this example, that this special property is true, or at least it works for the example that I've given you.

Kind of the opposite of this is also true. If I wrote H negative one, H of X is equal to X. Let me try and see if this is, well let me try and convince you that this is true. I've got the inverse function which is equal to X minus six over three. And if I'm going to replace the X here with the original function H of X, I'm going to end up with 3X plus six, my minus six over three, well, I guess I could, I could just drop the bracket, instead, let me just drop the bracket. So we've got this, and the six is sum to zero. So we've got 3X over three, which is just equal to X. And so the special property also holds. If we have the inverse function on the outside of the function, if it's the outer part with the original function on the inside, this property still holds.

On the screen beside me, you can see a formal definition of this special property between a function and its inverse function. It's basically what we looked at before, except we were using a general form of a function called H. Here we're using F. And in both cases, the exogenous variable, the independent variable was X. But of course, you know, it's not doesn't always have to be X. It could be any letter. In the next video, I want us to go through a specific example from economics. It's actually from first year economics. And I want us to look at the inverse demand function. And then to make things more even more practical, I want to show you how you can graph a function using Excel and make a very nice graph to go along with it.

