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SPEAKERS

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Welcome. In this lecture, I'm going to talk about what's like our favorite logarithmic function, which is the natural logarithm. And this is the one where we're going to, so what we're going to do is we're going to choose, so choose to have that our A, so I believe was red before. So our A is going to equal and this is this very special number, which is E, which is approximately 2.71828. It keeps on going, but it's roughly that much. And then what we're going to end up getting is that if we take log, right, so if we have $\log E$ of X, this has a very special name, which is called the natural logarithm. So this is equal to, and we write it like this. So, that's what it is and it's called the natural logarithm, okay? So this is called. And this is a special name. So this is called the natural logarithm. It's just a, it shows up enough that it has its own name and its own notation, which is, yeah, must be important. Own name, own notation. Okay. So we have, so what does that tell us? Because we've talked about, you know, logarithm with base A, and now we replace E in there. So here are some of the things that we know. We know that if we take the natural log of X, and I get out Y, so when this equals Y, well, that tells me that, so this happens if and only if or that tells me that this E value there to the Y equals X.

Okay, this is like the opposite way as I've been showing it to you before. But again, as I said, put hearts or stars or something so that you're only thinking about inputs and outputs. Instead of you know, Y always having to be an output and X always having to be an input. Okay? And then the next thing we know is that if I take the natural log of E to any value X, right, that this has to give me out X. Right? And this has to happen for every X in the real numbers, right? The next thing that I know is that if I take E, and then I take it to the natural log of X, like this, again, because these are inverse functions, this is going to equal X. Right, for every, now it has to be, X has to be greater than zero, right because of this picture. So that very much brings up perfectly, this is what the graph has to look like. So here's my horizontal axis, I have my horizontal axis X. I'll just draw it a little bit nicer.

So this is my horizontal axis X, and then I have my vertical axis Y. Like this, right, and my graph is going to end up looking like, so this is the graph of Y equals the natural log of X, right? We should actually get that this is, and maybe I'll draw this just like slightly different. We do actually get this vertical asymptote at zero. So it goes down like that. Okay? And we do know this, this particular point

on here, right here. This point is going to be 1, 0, right? Which is this circumstance, this comes from, so this is X , and that there is, right, my second coordinate's always my $\ln$ of X . Right? So that came from the fact that I know the natural log of 1 equals 0. Okay, so this is this, which is equal to, right, in this particular circumstance I'm looking, right, the natural log of 1, which we know has to equal 0, okay? And some things this tells us.

Okay, well the first one is that if I take F of X equal to the natural log of X , that this is increasing, right? This is an increasing function. As I increase my X values, my outputs increase, okay? And the second thing is that the natural log of 1 is 0, like I wrote there. And one way to think about that is exactly this thing that I was saying before, which is why do we know this? We know this because we know that e , right, to the 0 equals 1, and because we know that either 0 equals 1 because anything that is 0 is 1, that tells us that the natural log of 1 must have been 0. Okay? But we already kind of went through how to get this graph in the previous lecture where we did logarithms more generally with different bases. Okay? So, I hope that made some sense, and I will see you in the next lecture.