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SPEAKERS

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Welcome. In this lecture, I want to go through some kind of like visual example for the derivative function to kind of again help you kind of understand what's going on with it. So let's look at a particular function. So in this example, what I want to do is I want to look at the function that has F of X equals. So let's look at F of X equals 3X squared plus 1. Okay, so that's the function. You don't know this yet, but we will see, like in, in the future, but for now, I'm just going to tell you what the derivative function is. And the derivative function for this is, so we'd write that as like this, okay, that this is going to equal 6X. Okay, so if we kind of, would want to plug in some values there, let's kind of do a few. Okay, so if I want to take what is, you know, if I want to take the derivative of minus 1, then that's 6 times minus 1 equals minus 6. If I want to take the derivative at zero, that is 6 times zero, which equals zero. And then finally, if I wanted to take the derivative at 1/2, then this is going to equal 3, so this is going to be 6 times 1/2, which is going to equal 3. Okay, in each of these circumstances, I just put that number into this function here. I did the thing where every time the variable shows up, I put parentheses and then later on put in that value, just to make sure I get it right. Okay, now that's going to look at the picture. So over here we have, so we have our X axis and we have our Y axis.

Okay, and then actually, when we draw the function, so it's going to be something like this. It's supposed to be symmetric, I have troubles drawing something completely symmetric, so you're just going to have to pretend I did a better job of that. So this is going to equal, so this is Y equals F of X, which in this circumstance is 3X squared plus 1. Okay? So, okay, so that's my function, that's Y equals 3X squared plus 1. Now let's look at what these are going to tell us here. So we're going to look at what happens at, so the values we're interested in are minus 1, and then kind of half of that. So 1/2. And I know that the slopes are going to be slightly off because I'm drawing this kind of free hand. But at minus 1, you should get a slope of right, so this would be like up here, so I should get something like. So I'm looking at the tangent line here, we get something like this. Okay? So the tangent line. So looking at this, right, the tangent line, or actually the graph of the function itself, the same thing at X equals minus 1 has slope minus 6, so has slope minus 6, right? Since, and how do we know that? So we knew that because from over here, I had that the derivative function evaluated at minus 1 was minus 6. Okay, so that just came from evaluating the derivative function, which is that function there and minus 1 and I got out minus 6. Okay? Now we can also do this at zero, right? So if I go up here, and then you'll notice if I had drawn this correctly, this is actually should be flat there.

Okay, so here we have, this is a slope. So the tangent line at this point 0, 0. So you're going to get that this is, so the tangent line at X equals zero. So this is at X equals zero. Maybe I can explicitly write zero there. So X equals, so the tangent line at X equals zero. Or the graph of the function itself, line at X equals zero, has slope zero, since that's what we get when we stick zero into the derivative function. Okay? And then, good, and then I'm going to, just going to using those together, kind of go up like this, and then I'm here. If I had drawn this, well, this would be slightly more believable. But this, right, so now I'm going to look at I'm at 1/2, so I look over here, and the slope is 3, right? So the tangent line at, so I'm looking at this tangent line here, and the tangent line at, now we're looking at X equals 1/2, has slope 3, since that's what we get when we plug it into, since if I take the derivative at 1/2 I get 3, okay? So this is kind of seeing at different values, right, the derivative function gives me the slope at that particular X value. Okay, so it's going to kind of vary depending on what your input is. So it's kind of write down these, there's some takeaways here that are important. So here are takeaways. And the first one is going to be that the derivative function, so the derivative function, the derivative function is a function.

Right? It's this function F prime, so gives a, so it's going to give a usually different, right, like here, it's going to vary depending on what the input is, the output is going to vary, so it's going to give different outputs for each input. So for each input, I'm going to get an output and that's probably different than if I put in a different input. Okay, so different input and these outputs, so these outputs are going to give, right, the slope rate or rate of change or derivative at the input points.

Right, so I stick in an input, I get out an output, and that's the derivative or rate of change or slope at that particular input value, or at that point. Okay, the other thing I kind of wanted to emphasize is that for the same function, right, and this is the other thing we're seeing there is that for the same function, I'm going to get different tangent lines at different points. Or different tangent lines at different points, because this was the same function F of X, but a different points here, my tangent lines are very different. Different tangent lines at different points.

Okay, so this was just emphasizing that, you know, the derivative is a function. The output depends on the input, the output gives you the slope or the rate of change, or the derivative at that particular point, tangent lines at different points are different, you know, these kinds of things, which I think can get a little confusing. So I kind of wanted to give this to you, kind of very carefully, in some circumstances, you can kind of look back through to think through. Okay, so, I hope that made some sense, and I'll see you in the next lecture.