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SPEAKERS

Catherine Pfaff

Welcome. In this lecture, we're going to talk about using the definition of the derivative to compute the derivative of a constant. And what this is really going to be is computing the derivative of a constant function. So we'll do some brain orienting on what that means, because we know that can get a little confusing to people, before we actually kind of do the computation. So here we go. Okay, so what are we looking at? We're looking at a computing a derivative from the definition example. So computing a derivative. From the definition example, okay, and the one that we're going to be looking at, so let me underline that first, computing the derivative from the definition example. And I specifically want to look at F of X equals 5, okay, no matter what the input is, the output is 5, we'll talk about that a little bit more. And I want to know, what is the derivative with respect to X of this function? Okay, here we go. So let's do a little bit of brain orienting first, as I said. So this is just brain orienting, brain orienting. It's all we're doing here. Okay, so we're going to have, we have my X axis and my Y axis.

And then what we have is, no matter what my input is, my output falls at 5, okay? So this is F of X equals 5. So to consider kind of two points on here, what if I look at the point, right so the point where I have 1 here. So what is this point? This point is going to be 1 and then I stick it into my function and get out 5 it's going to be 5. What if I put in over here? Right? What if I'm at minus pi? I stick this in and I get minus pi, stick it into my function, I still get out 5. Okay? So what is this saying? It's saying that, what this function says is that the output of F of X equals 5, so the output of this function is always 5.

Okay, so if I put in, right, so if I put in F of negative pi, like I did over there, I get out 5, doesn't matter. Even if I would still put in F of 2 cubed, so like 8, I would get out 5, doesn't matter, no matter what I stick in the output is 5. Okay, so that's what that function is. It's good to have this in mind. So now let's actually do our computation. So we'll do kind of our computation over here. Okay, so what's happening in our computation? So if we take our function, and now I'm going to use different notation for the same thing, going to try to mix it up a little, we're still looking at DF DX. So I'm looking at F prime of X, we know that this is equal to the limit as H goes to zero.

Right, of, and then I have, yeah I'm going to make that red actually. I know that's red, I just don't have enough colors. So okay, so that this is going to equal this limit of, and then on top, I have, right, I have F, there's going to be two things up here. And then I'm going to divide by this H. And I'm going to have an H here. And then, right, so I have in here I have X plus H, and then I have X. But no matter what my input is, my output is 5, right? So it doesn't matter what this X is, whatever the input is, the output is 5. So this goes to 5. Same thing over here, this goes to 5. Okay, so what does that mean? Like in the next step, and remember very carefully, I'm going to reiterate this a lot. It's good to write out the limit. Right? You know, you're taking, you still haven't taken the limit yet. So you still need to have that, and so it's important to write it each time otherwise, you're going to get yourself a little bit confused. I've used to seen this many students. Okay? So now we have these outputs on top, so I have 5 minus 5 divided by H.

Okay, well, then this is going to give me a 5 minus 5 over H. Remember, I don't care about what happens at H, right? I don't care happens at zero. So I don't care what happens. It's here. It's not how limits work, you don't care what happens to the exact value, you care what happens close to it. Okay. So when I'm taking this, I know that when H equals zero, this becomes a mess. But as long as H does not equal zero, the top is zero, the H is nonzero, I'm good. So this makes sense to write this so that I have zero on top, and then I'm dividing by H. Okay, well, because I don't care what happens exactly at H equals zero, I only care about what happens nearby. As long as I'm nearby, the bottom number is a number and the top is zero. So this whole thing is zero. Okay? So this is actually going to equal the limit as H approaches zero of zero. Which is just going to be zero. Okay, so I'm going to get that, when I take, and I know I'm reusing the color red, but when I take this derivative I'm going to get zero.

But the key thing is, I got zero no matter, this is the zero function okay? Maybe I'll emphasize it. This is the zero function, right? No matter what I input, this is a function and no matter what I input it into it, I get out zero, right? Because it didn't depend on what my X was. This is the zero function. But the way we think of it, oops, I see. This is the zero. But the way that we think about it is that we're getting out zero, okay? This is the zero function. Okay, this is, right, so I take the derivative of a constant, I get zero, constant zero. Okay, so let's kind of recap what went on here. Okay, the first thing was when I'm taking the derivative of this, I'm taking the derivative of the constant function 5, which is a function that your output is always 5. Okay? But you can actually believe looking at this, the slope is always zero, right? No matter where I am, this slope is zero. Okay. And so when you do this computation, you're going to believe that you're going to get out the zero function, no matter what X value I stick in, my slope is zero. Okay? But let's just kind of test that, and the way you test is by taking this limit. But these outputs on top are always 5, right? So I get 5 minus 5, which is zero. The tricky thing to keep in mind is that when we're taking a limit, we don't care what happens exactly at this value. So we don't have to worry about the bottom being zero, and we're just zero over some number because we're only looking at close things. And in that case, that's going to be zero. Okay, so I hope that made some sense, and I'll see you in the next lecture.