

PfaffModule3L11

Wed, 1/19 1:41PM 8:18

SUMMARY KEYWORDS

equals, x minus, function, lecture, limit, defined, x equals, approaches, answer, undefined, precisely, put, ignore, function f , compute, x approaches, stick, axis, question, substitute

SPEAKERS

Catherine Pfaff

Welcome, in this lecture and the next I want to focus in on the situation of the limit as X approaches A where the function F is not actually defined at this value X equals A . We've talked a little bit about some of these examples, but maybe not quite as explicitly as we're going to talk about them in this lecture. So I'm going to kind of, and the next lecture, so we'll go through them now, there's, some of them may look a little familiar but hopefully, this will kind of help to piece it all together in your mind. So here's the question, which is for this lecture and the next, which is how do we compute, so how do we compute the limit as X approaches A , so the limit as X approaches A of F of X , when we're in one of these situations where F of X is not defined at X equals A . So when this function F of X is not actually defined for the input X equals A . So when F of X is not defined, F of X is not defined, at and we have X equals A .

Okay, so the short answer, and then we'll kind of go into all these circumstances, but it's a thing to keep in the back of your mind that the short answer here is actually that we ignore what happens at X equals A . So ignore what happens, ignore what happens at X equals A . Okay. So now we'll start kind of going through answers by example. So let's work through this example. So answer by example. Answer by example. I'm checking that I'm still on the board. Okay, so here's the first example that we're going to look at. And then in the next lecture we'll look at some more. So in this example, we want to look at the function F of X is going to equal X minus 1 squared, and then we're going to divide that by X minus 1. And then the question is, right, as a question kind of is throughout here, what is the limit as, except we're going to look, and we're going to specify that we're looking at X approaches 1. Why are we interested in X approaches 1? Why is that a little bit trickier? Right, if for any other value you can just stick it in? But at X equals 1, right, we're like, we are zero on the bottom. So we're undefined, it doesn't actually make sense to plug it into the function, so of F of X , and then the question is, what does that equal? Okay.

So this is, so what is this it precisely? Well, you know, using cancellation, as you guys have seen before, what is this? So this is going to be, this function is going to be, well, by cancellation, I have that as long as I'm not at 1, this is actually where, right, so where, right, X does not equal 1. So X does not equal that special value 1, right? And the same thing is the function X minus 1, okay? Now what happens at X equals 1? So it's actually undefined, so it's undefined when I have that X actually

equals 1. So where I have X equals 1, so I can't just substitute it in. I can't just substitute in 1 to, as we've done in some other problems, to figure out the limit there. Okay. However, we said we don't care what happens at X equals our A , or at X equals 1, okay? So this one we can ignore, right? You can ignore the undefined part. Okay? So we ignore because we don't actually care what happens at X equals 1. So don't care what happens, you don't care what happens at, and then we have this X equals 1, which is the same, right, value we're taking the limit at. So we don't care what happens there. So we're just going to use, so we will use, we will use the thing that functions are the same elsewhere. So we can go ahead and use that. So we will use this for the function, okay? So let's kind of draw that. We have our X axis here.

So here's our X axis, do it a little fast. So right, and then we have our Y axis, like this, and then we have this function. So at 1, right, at this value 1, well, if I stuck 1 into X minus 1, here, I would get zero, which is a function we're using. Okay? And this is how it kind of passes through here. So that's actually, but we're going to like put in open circle there, because we don't know what happens at the function there, but we're going to get, it is going to look exactly like X minus 1 everywhere else. No matter how close I get up to here, it doesn't actually matter, I'm still going to look like, as long as they don't actually hit X equals one, I'm still going to look like the function X minus 1. So this is the graph of Y equals F of X equals X minus 1 squared over X minus 1, right? And this looks like, right, so this looks like, this looks like Y equals X minus 1, except, except at this important X equals 1. So that's going to tell me what I need to know, right? So that's going to tell me, so what is my answer? So my answer in this particular circumstance is that, yeah, I do have room here so let's do the answer down here. Because it's not the answer to the overall question, it's the answer to this example. So I'm going to get the limit

as X approaches 1 of F of X is going to equal, well, I'm going to put, you know parentheses, I'm going to be able to just substitute it in, right? Because it's going to equal, I'm just going to put this 1 into the function X minus 1. Okay? So then just going to get out zero. Okay, so to kind of recap what we did in this one, right, the very important thing was that we only care about what that happens with the function everywhere like as it gets close to that value, but not at that value. We don't care that this is defined at X equals 1. We don't care that these two functions are different, right? This function and this function are different at X equals 1, we don't care. We only care what happens as we come in close. And as we come in close, right, we come in close here, we're coming in close here, we precisely look like the function X minus 1. So I could just stick this X equals 1 into that function X minus 1, and I would get out zero and that's how you compute the limit. Okay. So, I hope that made some sense and I will see you in the next lecture.