

PfaffModule8L07b

Wed, 2/9 1:37AM 9:17

SUMMARY KEYWORDS

antiderivative, indefinite integral, function, plus c, $x dx$, equals, integral, $3x$, bounds, relationship, $6e$, definite integral, evaluate, hereish, initial conditions, $2e$, family, put, cancel, dx

SPEAKERS

Catherine Pfaff

Welcome. There's this really kind of nice, crisp relationship between the definite and indefinite integrals. And so I wanted to take a little time to go kind of through that relationship in this lecture so that you can kind of see how they're actually connected. So suppose we're in a situation where we have that so suppose we have that F of X is the antiderivative of, and then we have the function little f of X that it's the antiderivative of. It's kind of common for people to like to use the capital of the same letter as the antiderivative, I don't know why, but it's fairly common. Okay, so for example, right, we could have that maybe F of X equals $2e$ to the $3X$. Right? And little f of X , then, would be $6e$ to the $3X$, right? If we take the derivative of this, then we get this. That's why that's the antiderivative. Okay. So let's just kind of go through each of them and then how they kind of relate. So where it's kind of clear to see. So the indefinite integral.

Okay, so we get the integral of, and then we get F of X DX is going to equal, and then we have the antiderivative and then we need to make sure not to leave out the C right? And just you know to remind you as many times as possible to get a specific function you must solve for this right? So to get a specific and not a family of functions, right. Right, then you would have to solve for, right, and how do we solve for this? We use initial conditions right. And then, right, so this, at this stage is a family of functions, right? So this here is a family of functions.

Right, so what's happened so far here? I integrate, I get the antiderivative with, this is like the generalized antiderivative, where it has the plus C in it, which is a family of functions, right. This happens with the indefinite integral. If I want only a specific function, and I need to have initial conditions, and I need to solve for that constant. But this is a very functiony kind of thing that's happening over here. And to look at kind of a specific example that we can then pull to over there. Then we have $6e$ to the $3X$ DX is going to equal and we have $2e$ to the $3X$, again plus this C . Okay? Maybe I was making it green, or at least the green's probably a little better. Okay. Now what happens with almost the same setup, so let's look over here at the definite integral, put it like right hereish.

Okay. Okay, so what's happening on this side, now I'm going to have bounds right, so the integral, and then we'll put our bounds here in another color so I'll put them in blue. So hopefully it's a little

and then we'll put our bounds here in another color, so I'll put them in blue. So hopefully, it's a little bit distinct from the white I know not they they but you can kind of see their bounds there of, and then we have F of X DX . And it's not as if this never shows up, right? What are we actually doing here? We're going to get, so I'm going to get the, I'm going to get the antiderivative and then I'm going to evaluate it. Right, I write it like this, maybe from X equals A to X equals B . And then what do I mean by that? So this is the same thing as here, but the plus C is kind of missing. Instead, I'm going to put in my bounds. So I'm going to take F of B minus F of A . And what I have here is actually a number. Okay, so this is a number. This is a number. So over there, it was a family of functions, unless I use an initial condition to solve for the constant, and then it's a particular function. Over here, I've got a number. But in both cases, it has to do with the antiderivative. And if we kind of look at the same one as over there. So if I take the integral from 1 to 2 of $6E$ to the $3X$ DX , then what am I going to get? So I'm going to get right, so we take this antiderivative, which is that same function as over there. And you know, I really like this trick where we take $2E^3$, and then I put parentheses there so that I don't get confused about what I'm putting where. So I always like to do this. And then I put in the top bound, and then the bottom bound. So this is 2 and 1. Okay? And then just you know, this is, this is 6, this is 3. So I actually get out a number, right? Because the number I get out, I going to get out 2 I just pulled out because there was a 2 in both of them. And then I get E to the 6 minus, I already pulled out the 2's, I'm just left with E to the third power, B cubed, there's a word for that one. Okay, so looking at these two, right? I've got a number, I've got a family of functions, what's the relationship between them is that I actually took this and I evaluated it at the bounds. Okay, so the relationship is.

I have the integral from A to B of F of X DX is going to equal the integral of F of X DX . Right? And then this integral when I output this integral, right, I would get this. And don't, the C right, the C would drop out because I could have put a plus C in a very, in a different color, right? I could have had, it wouldn't have been any problem if maybe I can do it in kind of dots. What if I put a plus C here? It doesn't really work, does it? Right, I could have put a plus C there, and then it's very light, plus C here, right? And what would have happened? I would have like gotten C , I would have gotten minus C , and they would have canceled. So it really didn't need to be there, right? But I could really take this and I'm evaluating you know, my bounds. I'm evaluating this precise function at 2, and then this precise function at 1, and taking the difference between them. Okay? So this is actually equal to my going from X equals A to X equals B , on, on here like that. Okay? With again, we don't care about, you know, the constants. In fact, I'm going to kind of cross them out. We usually don't even bother to include them, okay? Because they're going to cancel out anyway. Okay, so differences between indefinite and definite integrals. Indefinite integral family of functions, if I use my initial conditions to solve for my C then I get a specific function, but it's still a function. But it's the same function, right, it's the antiderivative, that I would use over here and evaluate, like, I would evaluate at my bounds right and subtract them. Okay? So I hope that made some sense and was helpful and I will see you in the next lecture.