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SUMMARY KEYWORDS

particular time period, integration, function, quantity, differentiation, velocity, rate, integrate, change, acceleration, differentiate, increase, direction, intuition, circumstance, overall goal, f prime, function f, kilometers, theorem

SPEAKERS

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Welcome. In this lecture, I'm going to give a bit of an overview of integration and its relationship to differentiation, okay? So here's kind of the setup of what's going on. And in the, so we kind of have an overall goal. So what is kind of the goal with integration? And the goal is going to be to answer questions like, so answering questions like, so here's an example. So if the quantity changes at, so if we have some kind of quantity, so we're taking a quantity, but we're taking actually a change of quantity, okay? So if the quantity changes at a nonfixed rate. So we have a nonfixed, so this is kind of important, so we have at a nonfixed rate, right? So we have a a quantity that's changing at some kind of rate, but it's not actually fixed, then the question is, how did the quantity increase over that particular period of time? Okay, so how did the quantity increase? So how did the quantity increase over a particular period of time?

Particular time period, particular time period. Fix that funny U, so that when you're kind of reading not it's not confusing. Okay. So particular time period. Okay, so let's kind of look at kind of the process of what's going on. I mean, like, later on, we'll kind of actually go through a little bit. But you know, you had this kind of circumstance before where you could take some kind of function. So I've got some kind of function F of T. So this is a quantity function, the quantity function. Right? And then I had this process, right, which was differentiation. And what would it do, it would take me over to the derivative, so this would be F prime of T. Okay, which is a rate function, right? So it's giving the rate of change of F of T with respect to T, okay? So this is a rate function giving and this is kind of important. Give me giving the rate of change, of, right, this kind of quantity output F of T with respect to T.

Okay, let me kind of box this a little bit. Okay. So before this is kind of what we've been doing is you take, you know, you take this quantity function, you differentiate, you get this rate function. And then what integration is going to do is it's going to tell you how to go back in the other direction, pkay. So to go back in the other direction you're going to use this is where you use integration.

Okay, so let's kind of look at an example. So an example to keep in mind. I'm going to switch over to

Okay, so let's kind of look at an example. So an example to keep in mind, I'm going to switch over to blue here. So an example to keep in mind. This is one as we kind of go through everything you can ask yourself, what does it mean in this circumstance? I like this example. I know that this is not a course for physics or something like this. I like this example because this is something that we deal with in our everyday lives. Okay? So it's one we have a lot of intuition for, which can help us to check that what we're doing makes sense, okay? So I'm going to have one function P of T, which is going to give me the position at time T. So position at time T, and that's what that function is. And then I have a second function, which is V of T. And this is going to give me the velocity at time T.

Okay, and then I have a third function, A of T, which you might guess is going to give me the acceleration at time T. Okay, so the way that this kind of works here and goes, so we start with, so we have this position, right? And then we kind of remember, right, it's, so if to go over to the rate of change of this, which is what we want to do, just having trouble remembering. Right? Velocity is the rate of change of position, so to go in that direction I want to differentiate. Right? So this is a differentiate. Right? If I want to go back from velocity to position, I want to integrate. Okay, now what about going from velocity to acceleration? Acceleration is actually the change in velocity, it's a rate of change from velocity. So to go in this direction, I want to differentiate to go back in the other direction. I want to integrate.

Okay, so what is the deal with integration, okay? When you're differentiating, you're taking a quantity function, and you go to a rate of change function, okay? At the particular time T, F of T was a quantity. At the particular time T, F prime of T was a rate of change of that quantity. What if I want to go the other direction? I actually start out knowing the rate of change, and I want to know, well, you know, what if it's actually, you know, sometimes maybe the temperature is increasing at a non-steady rate, you're, you know, your velocity is not steady, you're not just driving at 60 kilometers per hour, it's varying. And then you want to know, how far did I go? Or how much did the temperature increase or something like this, okay. And like over a particular period of time, and this is what integration is gonna allow you to do. And then the fun fact is that it kind of undoes differentiation. This is a theorem. And so you go from this quantity function to different like, you differentiate, you get a rate function, and then you integrate, and you get back. So that's kind of exciting. So, I hope that made some sense, and I'll see you in the next lecture.