PfaffModule7L14

Thu, 1/27 7:54AM 7:02

SUMMARY KEYWORDS

equal, integral, respect, integrate, derivative, interval, change, net, units, function, population growth, increased, marginal cost, rate, notation, cost, x dx, population increases, theorem, application

SPEAKERS

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Welcome. In this lecture, I'm going to talk about the net change theorem, which is kind of how you apply the integral. So let's go ahead and kind of state it. So here's in a vague sense, and then you'll see what I mean by it, so the net change theorem, what it says is that the integral of the rate of change is equal to the net change. So the integral integral, the rate of change, whatever the function is, for the rate of change, and you integrate that, you're going to get the net change over the integral that you, over the interval that you integrate it over. Okay? So let's go ahead and look at an application. Or applications, we can look, we'll look at two. And then you know, there'll be more, okay. So, the first one will be if I have DY DT, and my function here is N, so have the rate of change with respect to T of, of this function N, and we're going to suppose that this is equal to the rate of population growth. So this is equal to the rate of population growth.

And we're going to assume that this is with respect to time, to time T, okay? Then what we're going to get is if we take the integral, and we go from T equals T one to T equals T two, and we integrate this rate of change of the population growth, so this is like the population growth, okay? Then we're going to get that this is going to equal, so we have these values of N, we're going to look at the value at, tight, so T two, so we do the upper one, and then we subtract off the lower one. Okay? And this here is equal to the net population change. So this is equal to the net population change. Right, as we go from, right, this time T equals, so the from time equals T one to when we go to time equals T two. Okay? So we're looking at how the population increases be on that interval from the time T one to the time T two, and what do we do? We integrated the rate of change. Okay, so let's look at another example. So that's our first application, our second one would be over here.

Okay, and now what we're going to look at, so here, C of X is going to equal the cost of producing X units of a commodity. So cost of producing X units of some commodity, whatever the commodity is, okay, so our function C, if I want to know the cost of producing 3 units, I stick 3 into this C, okay? And then there's something called like the marginal cost. And so this is the derivative with respect to X, here, the same function, okay. I'm purposely using the different kinds of notation to show that you know, I'm taking the derivative here. I'm, you know, use like the prime notation here, and I'm using this notation here, so that you see this as the same thing, okay? So this is going to equal the marginal cost.

Okay, and then we're going to have, so this is how do we figure out how the cost increased on over an interval of time, then I'm gonna want to take the integral from X one, so this is now X equals X one. You don't always have to write that but I find it kind of nice because it can help to keep straight what you're integrating with respect to, and what you're in your bounds are with respect to, you'll see later that that's useful and can get confusing if you don't do that. So we take of X DX, and this is going to equal, right and you can probably already guess from over there, we're going to take the cost at the upper value minus the cost at the lower value, okay? So, the cost when we had X two units minus the cost when we had X one units. Okay, so this is in equal to, so in kind of interpreting what's going on here, this is the increase in cost. So this is the increase in cost, when production increased, so when production increased.

Okay, so this is increasing cost when production increased from, right, from having X one units, right, the bottom value, so X one units, right, to and I'll write in to in a moment, X two units. Okay? Okay, so how does the net change theorem work? The net change theorem is going to give us, you know we're going to start with a rate and then we're going to want to know, for the original function, how did it increase over a particular interval? And how do you figure that out? You integrate the, you're going to integrate the rate of change over that interval, or the derivative over that interval. Okay? So I hope that made some sense, and I'll see you in the next lecture.