Hi. Welcome back to recitation. In lecture you introduced the idea of differentials and learned how to compute them. So I have a couple examples here for you to do.

So compute the differential d of 7 u to the ninth plus 34 minus 5 u to the minus third. And d of sine theta cosine theta. So why don't you take a minute, work those out and we'll come back and we'll work them out together.

All right, welcome back. So hopefully you had some luck with these. Let's go through them. So right, so a differential is really, it's just another notation for something you already know how to do. So it's another way of keeping track of a derivative. The thing we don't write is we don't write the over the d, the variable we're differentiating with respect to. So we pick that up from what we're taking the differential of.

So in this case, we look at this expression. Let's do the first one first. So we look at d 7 u to the ninth plus 34 minus 5 u to the minus third. And we just can distribute that d through in the same way that we can with ordinary derivatives.

So OK, so this is equal to 7 d of u to the ninth plus d of 34 minus 5 d of u to the minus third. And now we just do the chain rule. So here d of u to the ninth is 9 u to the eighth du. So that du comes out of that chain rule that we're doing. So this is equal to-- so well, 7 and we drop the 9 down-- so that's 63 u to the eighth du plus-- well OK, d of 34, 34 is a constant. It just kills it. That's 0. Minus 5 d of u to the minus third. So again, u to the minus third. That's just a power of u. We apply our usual rule for it. So it's minus 3 u to the minus 4 du. du from the chain rule.

Again, and so we have minus 5 times minus 3 is plus 15. Good, so I get to keep my plus sign. Plus 15. What did I say? u to the minus 4 du.

And so that's all there is to that. Now let's do the second example here. We have sine theta cosine theta. So same exact idea. Here we have a product rule as our first step. So OK, so we take the derivative of the first times the second. So the derivative-- the differential of the first, I should say. Right? So the product rule for differentials is just the same as the product rule for derivatives except instead of taking derivatives you take differentials.

So the differential of sine theta is cosine theta d theta. And then times the second. Plus the first, sine theta, times the differential of the second, which is minus sine theta d theta. OK. And now if we like, we can, you know, put this all together, factor out the d theta to the end. And we can rewrite this as cosine squared theta minus sine squared theta d theta.

And of course you could rewrite this a bunch of other ways using your trig identities. Just like you could have started by writing sine theta cosine theta as 1/2 sine of 2*theta before taking the differential.

All right, so that's really all there is to that. So there you go. Differentials. I'll end there.