8. Synthesis: Q and A

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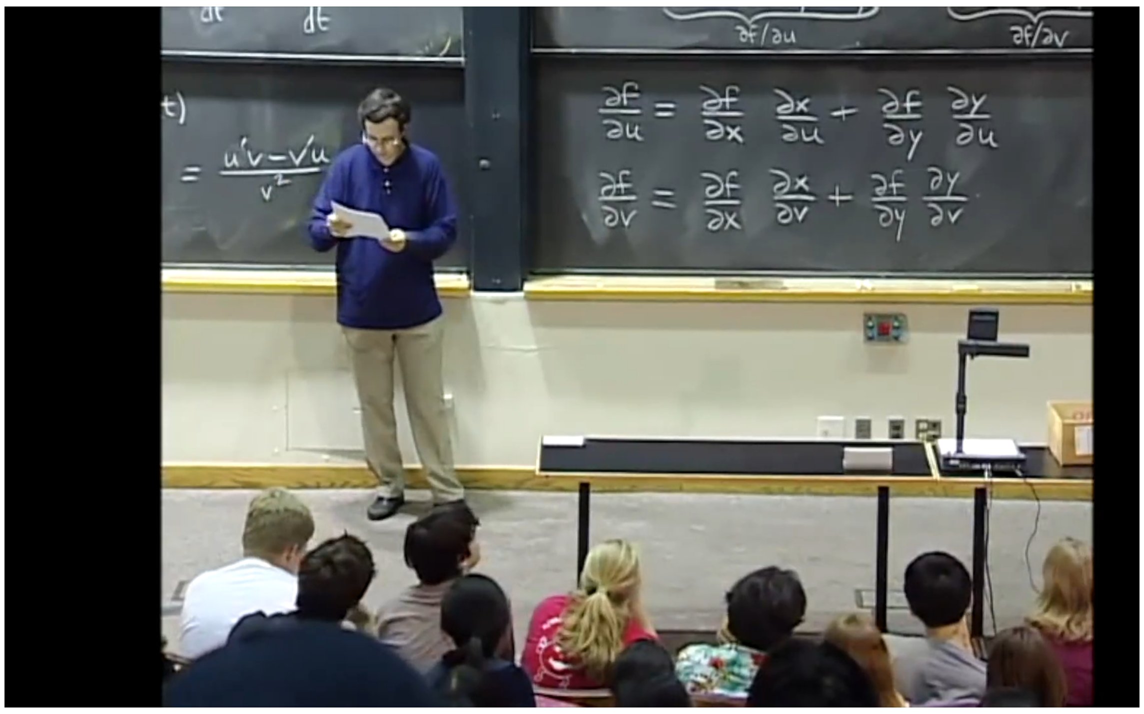
Synthesize

Q And A



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continue with your chain rules.

Maybe you would know how to express partial x partial u

in terms using the chain rule.

Sorry, so if u and v depend on yet another variable

then you could get the derivative with respect

to that using first the chain rule to pass from u v

to that new variable.

And then you would plug-in these formulas for the partials

with respect to u and v.

So in fact, if you have several substitutions to do

you can always arrange to use one chain rule at a time.

You just have to do them in sequence.

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1. When would you use this?

One case in which you would use the chain rule is if you have a function which has a simple expression in terms of some "helper" variables, say x and y, but what you can actually control are other variables u, v on which x and y depend. It might be easier to work directly with the derivatives instead of finding the explicit formula for f in terms of u, v.

2. Before we had the straight d's but here we have the curly d's. What's the difference?

The straight d's are used when that quantity depends on only one input variable, such as $y = f(x)$. It is certainly possible to have curly d's and straight d's in the same equation depending on the context. It is also possible to just use curly d's everywhere.

3. If u and v both depended on another variable what would that look like?

Then we would be in a situation where we have a function that depends on u, v with known rates of change (given by the equations we already found) but we can't control u, v directly and instead we control another variable on which they depend. This means we could apply another chain rule to get the desired derivatives.

It may also be simpler to manipulate differentials.

4. Since we have differentials like df, do we have "partial differentials" like ∂f? If so, how do those work?

No, the expression ∂f does not have meaning, even though df does. The total differential df accounts for all the changes to f, from all the input variables. The symbol ∂f alone does not have meaning because it is like an unfinished sentence. In order for ∂f to have meaning, we would need to specify whic

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