

# Note to Class: Simplifying the Derivative of $1/f$

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We took Quiz 4 on Thursday, and it featured a problem which looked something like this:

- Find  $f'(x)$ , where  $f(x) = \frac{5}{1 + e^{-3x}}$ .

We could solve this problem using the quotient rule as follows:

$$\left[ \frac{5}{1 + e^{-3x}} \right]' = \frac{(1 + e^{-3x})(5)' - 5(1 + e^{-3x})'}{(1 + e^{-3x})^2} = \frac{(1 + e^{-3x})(0) - 5(-3e^{-3x})}{(1 + e^{-3x})^2} = \frac{-5(-3e^{-3x})}{(1 + e^{-3x})^2}$$

Some of you asked if the last step was necessary or not – do you need to simplify the expression by removing the term which is equal to zero? At the time, I said that, given the policy that answers do not need to be simplified, it would probably be okay to leave it there, but that I'd ask Dr. Shulman. I've now heard back from Dr. Shulman, who's said that you should go ahead and remove this term. In other words, your final answer to this problem should be either

$$\frac{-5(-3e^{-3x})}{(1 + e^{-3x})^2} \quad \text{or} \quad \frac{15e^{-3x}}{(1 + e^{-3x})^2};$$

you'd probably lose a few points for leaving your answer in the form

$$\frac{(1 + e^{-3x})(0) - 5(-3e^{-3x})}{(1 + e^{-3x})^2}.$$

If you left your answer in the form above on the quiz I obviously won't be taking off points since I told people it was okay at the time. However, please note that you would probably lose points for doing the same thing on the exam. Let me know if you have any questions about this when we go over the quiz on Tuesday.