

HINTS FOR HOMEWORK 5

Now that we have the power rule (together with the computations we've done to compute the derivatives of exponential and trigonometric functions), and since we will soon acquire the product, quotient, and chain rules, we're going to be able to compute just about any derivative we want. This means that we're going to make a dramatic leap in computational ability. Whereas something like $\frac{d}{dx} \left[\frac{x}{x+1} \right]$ was about the hardest thing we could do when we only had the definition of the derivative as a limit, by Wednesday we will be able to compute things like

$$\frac{d}{dx} \left[e^{\sqrt{x^2 + \sin(\cos(\tan(x)))}} \right]$$

(if we really wanted to).

But with great power comes great responsibility: we have to be able to use these new tools if we're going to be able to compute crazy derivatives. Because of this, I've assigned a lot of derivatives in this week's homework. The hope is that by doing lots of derivatives, you'll be forced to become comfortable with the rules. Then when you see these things on tests or quizzes, you'll knock them out of the park.

Here's my advice. The first 25 problems or so are problems concerned with material we've already covered in class. I would go ahead and knock those out as soon as possible. You'll need to know the power rule and the derivatives of functions like e^x , $\sin(x)$, and (a few times) even 2^x . We have formulas for all of these derivatives. For instance, we saw in class that

$$\frac{d}{dx} [2^x] = (\ln(2))2^x.$$

Anytime you're asked to compute a derivative that includes a term like \sqrt{x} or $\sqrt[5]{x^3}$, I would suggest writing these quantities in exponential notation (e.g. $x^{\frac{1}{2}}$ and $x^{\frac{3}{5}}$ for the quantities above). This will make it easier to use the power rule, hence making your computations easier. For instance, if you're asked to compute $\frac{d}{dx} [x\sqrt[3]{x}]$, I would begin by realizing that this is the same as $\frac{d}{dx} [x \cdot x^{\frac{1}{3}}] = \frac{d}{dx} [x^{1+\frac{1}{3}}] = \frac{d}{dx} [x^{\frac{4}{3}}]$. Now you can use the power rule to compute the derivative.

In class Monday we'll talk about the product and quotient rules, which will make the next 10 problems do-able.

The problems after that will require the chain rule, which we won't get to talk about til late in class on Monday or possibly Wednesday. This is the topic that students traditionally have the hardest time with, so I would suggest having the other problems finished by Wednesday so you can spend the rest of your time focusing on these potentially trickier problems (though once you get the hang of using the chain rule, it will become a lot easier).