213 Problem Set 7 Solutions

§3.7 34 Ok, I see the answer is there, but I am checking work. I don't feel so bad about this. $h(x) = (x^4 + g(x))^{-2}$. The outside function is [something]$^-2$, and that's our starting point. The derivative of $h(x)$, i.e. $h'(x) = (-2)$[something]$^{-3}$[derivative of something]. Combining that back together we have $h'(x) = (-2)[x^4 + g(x)]^{-3}[4x^3 + g'(x)]$. Next we want this at $a = 1$: $h'(1) = (-2)[1^4 + g(1)]^{-3}[4(1^3) + g'(1)]$. Taking values from the table gives us: $h'(1) = (-2)[1^4 + 3]^{-3}[4(1^3) + 0]$. I'm ok with that as an answer, but the book goes further, so ... $h'(1) = -2\frac{1}{64}4 = -\frac{1}{8}$.

§3.10 4 $f(x) = \sqrt{e^{2x} + 2x}$. This is good practice for the chain rule. There are several steps here. Overall we have $\sqrt{\text{something}}$, but inside we also have $e^{\text{something}}$. Before we do anything, let's pack up the square root into an exponent: $f(x) = [e^{2x} + 2x]^{1/2}$. Like above the derivative of $f(x)$, i.e. $f'(x) = \frac{1}{2}$[something]$^{-1/2}$[derivative of something]. The inside here is $e^{2x} + 2x$, the second part there is easy and just has derivative of 2, but the first is a little bit tricky, because there's a tiny piece that's easy to miss. The derivative of $e^{\text{something}}$ is $e^{\text{something}}$[derivative of something]. In our case the derivative of e^{2x} is $e^{2x}2$. That little two is easy to miss, but needs to be there because of the chain rule, so, back to where we were: $f'(x) = \frac{1}{2}$[something]$^{-1/2}$[derivative of something].$= \frac{1}{2}[e^{2x} + 2x]^{-1/2}[e^{2x}2 + 2]$. And, I *really* don't want to repackage that, so I like that as my answer.

For the upcoming exam, make sure that you practice and know also derivatives of logarithms and the quotient rule.