MATH 30, SPRING 2020: LECTURE 27

Say that g is the inverse function of f. By definition, this means $g(f(x)) = x$ for **every** x in the domain of f. This means the two sides are equal *as functions*, so they have the same derivatives. The Chain Rule then says:

$$g'(f(x))f'(x) = 1.$$

I recommend *not* memorizing the formula. Just use the Chain Rule from scratch every time!

1. Consider the function $g(y) = 3y + 2$. Call the inverse function $f(x)$, so that $g(f(x)) = x$ for all x. Find the value of $f'(4)$.

2. Consider the function $g(y) = y^3 + 2y + 3$, Call the inverse function $f(x)$, so that $g(f(x)) = x$ for all x. What is $f(0)$? Now find the value of $f'(0)$.

3. Consider the function $g(y) = 7^y$ ("7 to the y"), whose inverse function is called $f(x) = \log_7 x$. Thus we have $g(f(x)) = x$ for all $x > 0$. What is $f(7)$? Now find the value of $f'(7)$.
   [In case you forgot the derivative of g, just remember that $7^y = (e^{\ln 7})^y = e^{y \ln 7}$.]