

Math 1A Worksheet 17

March 12th, 2008

1. Let $f(x) = x + \ln x$. Find $(f^{-1})'(1)$.
2. Find $\frac{d^{100}}{dx^{100}} x e^{-x}$.
3. Let f be a nonzero invertible function.
 - a) Show that $\frac{1}{f}$ is also a nonzero invertible function.
 - b) Is it true that $\left(\frac{1}{f}\right)^{-1} = \frac{1}{f^{-1}}$? (Here -1 indicates the inverse **function**, not the multiplicative inverse). [Hint: test some functions. I suggest testing $f(x) = e^x$.]
4. Give an example of two functions f and g , defined for all real numbers, such that neither f nor g is one-to-one, but $f \cdot g$ is one-to-one.
5. Give an example of two functions f and g , defined for all real numbers, such that $f \circ g$ is one-to-one but f is not one-to-one. [Note: g may (and indeed, must!) be one-to-one!]
6. (Berkeley Prelim, Spring '84) Which is larger, π^3 or 3^π ? [Hint: there are many different ways to do this, but all involve comparing the functions x^3 and 3^x .]