

Math 141 Honors Problems #6

Due date: Tuesday, 9/29/09

HP11 [3 points] Mike from Mizzou has trouble with the Quotient Rule; he thinks that $\frac{d}{dx}(f(x)/g(x)) = f'(x)/g'(x)$. On his last calculus test, Mike applied this erroneous rule to a quotient in which $g(x) = x$. Somehow, he managed to get the right answer. What are all the possibilities for the function $f(x)$?

(Note: This problem comes from the 2007 KU Mathematics Prize Competition.)

HP12 [3 points] Using only algebra and the definition of the derivative as a limit, prove that

$$\frac{d}{dx}x^n = nx^{n-1}$$

for all rational numbers n . (That is, $n = p/q$, where p is an integer and q is a nonzero integer. It doesn't hurt to assume that q is positive.)