Math 166: Honors Calculus II Quiz 3 Feb. 9, 1995 Name:\_\_\_\_\_

1. Compute the derivative of  $f(x) = (1 + x^2)^{\sqrt{1+x^2}}$ .

2. a) Define the hyperbolic trig functions,  $\cosh(x)$ ,  $\sinh(x)$ , and  $\tanh(x)$ .

b) Derive the derivatives of  $\cosh(x)$ ,  $\sinh(x)$ , and  $\tanh(x)$ .

c) Derive a formula for  $\sinh^{-1}(x)$ , the inverse function of  $\sinh(x)$ ; state its domain and range.

3. a) State and prove the Theorem on Derivatives of Inverse Functions.

b) Prove that 
$$\frac{d}{dx} \arcsin(x) = \frac{1}{\sqrt{1-x^2}}$$
.

4. BONUS QUESTION: Derive a formula for the derivative of the infinite exponential function  $y = x^{x^{x^{\cdots}}}$ , defined for  $0 < x \le e^{1/e}$  as the inverse of  $x = y^{1/y}$ .