Prof. A. Suciu Name: ______________________

MTH 1733 — Honors Calculus 1 — Fall 1997

Quiz 1

In Problems 1 and 2, H is infinite, ϵ is (a non-zero) infinitesimal, and x is standard.

1. Tell whether each of the following expressions is infinitesimal, moderate, or infinite.

(i) $\dfrac{\epsilon - 2}{\epsilon^2}$

(ii) $\dfrac{\epsilon^2 - \dfrac{1}{\epsilon}}{\epsilon^2 + \dfrac{1}{\epsilon}}$

(iii) $\dfrac{\sqrt{H^2+1}}{3H-2} - \dfrac{1}{2}$

(iv) $\dfrac{5H+6}{H^2+3H+2}$

2. Find the standard parts of each of the following numbers.

(i) $\dfrac{\dfrac{2}{x+\epsilon} - \dfrac{2}{x}}{\epsilon}$

(ii) $\dfrac{(H+1)^2 - 5}{H^2+2H+1}$

(iii) $\dfrac{27 - (3+\epsilon)^3}{\epsilon}$

3. Determine whether the following functions are differentiable at the indicated point (using the definition of the derivative). If differentiable, calculate the derivative at that point.

(i) $f(x) = \dfrac{1-|x|}{1+|x|}$ at $x = 0$

(ii) $f(x) = x|x^3 - 2|$ at $x = 0$

4. Find the derivatives of the following functions:

(i) $y = \dfrac{1}{2}x^4 + \dfrac{2}{5}$

(ii) $y = \sqrt{x^3} - \dfrac{1}{\sqrt{x}}$

5. Let $f(x) = x^2 - 3x + 1$.

(i) Find the equation of the tangent line to the graph $y = f(x)$ at the point where $x = 2$.

(ii) At what point on the graph $y = f(x)$ is the tangent line parallel to the line $y = 7x - 6$?