

Economics 205, Fall 2007

Quiz I

September 5, 2007

Instructions. Try to answer all three problems. (Read all of the questions now and start on the ones that seem easiest). Make your answers as complete and rigorous as possible. In particular, give reasons for your computations and prove your assertions. Informal and intuitive arguments are better than nothing.

1. Consider the function $f(x) = x^3 - 3x + 1$.
 - (a) Graph the function. Clearly label all of the local maxima and minima.
 - (b) Find the maximum value of f over the set $[0, 10]$.
 - (c) Find the equation of the line tangent to the graph of $y = f(x)$ at the point $(x, y) = (2, 3)$
 - (d) Find the derivative of the function $g(x) = (f(x))^{10}$ evaluated at $x = 2$.

2. Find the indicated limits (if they exist). Justify your answers either by appealing to a general property of limits or by giving an $\epsilon - \delta$ proof.
 - (a) $\lim_{x \rightarrow 2} (3x + 5)$.
 - (b) $\lim_{x \rightarrow 2} \left(\frac{x}{x+1} \right)$.
 - (c) $\lim_{x \rightarrow 1} \left(\frac{(x-1)(3x-5)}{x^2-1} \right)$.
 - (d) $\lim_{x \rightarrow 1} \left(\frac{1}{x-1} - \frac{3}{1-x^2} \right)$.

3. Determine whether the functions below are continuous at $x = 0$.
 - (a) $f(x) = \begin{cases} 0 & \text{if } x < 0 \\ x & \text{if } x \geq 0 \end{cases}$
 - (b) $f(x) = \begin{cases} 0 & \text{if } x = 0 \\ \frac{x^2+3}{x} & \text{if } x \neq 0 \end{cases}$