Examination 1 - Math 141, Frank Thorne (thornef@mailbox.sc.edu)

Wednesday, September 26, 2012

Please work without books, notes, calculators, or any assistance from others. If you have any questions, feel free to ask me.

Please do your work on separate paper; you should staple this sheet to your work (put this on top) and turn in everything together.

(1) By finding the slopes of appropriate secant lines, determine the equation of the tangent line to $y = 1/x$ at $(1,1)$.

(2) Evaluate the limit $\lim_{x \to 1} \frac{x^3 - 1}{x^2 - 1}$.

(3) Evaluate the limit $\lim_{x \to \infty} \left(\sqrt{9x^2 + x} - 3x \right)$.

(4) If $f(x) = \sqrt{3x + 1}$, find $f'(x)$ using the definition of the derivative.

(5) If $y = 4\pi^2$, find $\frac{dy}{dx}$.

(6) If $y = \frac{x^3}{1 - x^2}$, find $\frac{dy}{dx}$.

(7) Give the definition of the *derivative* of a function $f(x)$ at the point $x = a$. (Please give the algebraic definition, using an equation.)

Draw a picture and explain why your equation gives the slope of the tangent line to the graph of $f(x)$ at $x = a$.

(8) The figure shows the graphs of f, f', and f''. Identify each curve, and explain your choices.