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

Wednesday, September 14, 2011

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.

YOUR NAME:

(1) Sketch a rough graph of the outdoor temperature as a function of time during a typical spring day.

(2) Graph the function $y = 1 + 2\cos x$, not by plotting points, but by starting with the graph of $y = \cos x$ and applying the appropriate transformations. (Be sure to explicitly explain your work.)

(3) Explain what is meant by the equation

$$\lim_{x \to 2} f(x) = 5.$$

Is it possible for this statement to be true and yet $f(2) = 3$? Explain.

(4) Evaluate the limit

$$\lim_{x \to -1} \frac{x^2 - 4x}{x^2 - 3x - 4}$$

if it exists.

(5) Evaluate the limit

$$\lim_{x \to -\infty} \frac{1 - x - x^2}{2x^2 - 7}$$

if it exists.

(6) Evaluate the limit

$$\lim_{x \to 0} \left(\frac{1}{x} - \frac{1}{x^2 + x} \right)$$

if it exists.

(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) If $f(x) = 1 - x^3$, find $f'(0)$ (directly from the definition of the derivative) and use it to find an equation of the tangent line to the curve $y = 1 - x^3$ at the point $(0, 1)$.