pages	$1-3$	$4-6$	$7-8$	*total*
scores				

Exam #1, October 30, Calculus I, Fall, 2006, W. Stephen Wilson

I agree to complete this exam without unauthorized assistance from any person, materials or device.

Name: _____ Date: _____

TA Name and section: _____

NO CALCULATORS, NO PAPERS, SHOW WORK. This exam may well be too long. Use your time wisely. (40 points total)

(1) (2 points) Compute: $\lim_{x \to 0} \frac{\sqrt{2-x}-\sqrt{2}}{2x}$

(2) (2 points) Compute: $\lim_{x \to \infty} \frac{e^{-x}}{1-e^{-x}}$

(3) (2 points) Compute: $\lim_{x \to 0} \frac{\sin(x)\cos(x)}{x(1-x)}$

(4) (2 points) Compute: $\lim_{x \to 0} \frac{(e^x - 1)^2}{\sin^2(x)}$

(5) (2 points) What is the equation for the tanget line to $y = x^2$ at $x = 2$?

(6) (2 points) Let $y = \frac{f(x)}{x}$. What is $y' = \frac{dy}{dx}$?

(7) (2 points) Let $y = \sqrt{1 + f(x)^2}$. What is $y' = \frac{dy}{dx}$?

(8) (2 points) Let $y = f(x)^y$. What is $y' = \frac{dy}{dx}$ when $x = 0$ and $y = 3$ if $f(0) = 2$ and $f'(0) = 4$?

(9) (2 points) Let $y = (1 + \cos(x))^3$. What is $y' = \frac{dy}{dx}$?

(10) (2 points) Let $y = 2^{\sqrt{x^2-1}}$. What is $y' = \frac{dy}{dx}$?

(11) (6 points) Sketch $y = f(x) = x(x^2 - 1)$. Label all important properties. Show work.

(12) (6 points) The surface area of a sphere of radius r is $4\pi r^2$ and the volume of the sphere is $\frac{4}{3}\pi r^3$. You have 100 square inches of material to cover a sphere and a cube (with edge x). You want the minimal total volume enclosed by the sphere and the cube. What must r and x be? (Good partial credit for the ratio of r to x.)

(13) (8 points) Two idiots have been driving around the Cartesian plane. At time t, the first idiot is at point $(3t, 4t+4)$ and the second idiot is at $(t, 2t)$. How fast are they moving towards each other (or away from each other) at time $t = 0$? When are they closest to each other? How close are they and where are they when they are closest?