Math 1251 Exam 1 April 17, 1997 Your Name _____

Professor Stanton

Directions: This exam has 4 problems with the point values indicated. Do all four problems. You may use your notes, books, and calculators. If you use a table (or calculator) to find your answer, write down the word "table" (or "calculator") next to your answer. If your answer is correct, you will receive full credit for that problem, otherwise you will be awarded 0 points. This means if you copy a minus sign incorrectly you will be given 0 points. An answer alone with no justification is worth 0 points.

(15) 1. Find the equation of the tangent line to the curve $y = 2x + 1/x$ at the point (1,3).

(50) 2. Find the following derivatives and limits.

(a) If $y = (3x - 2)^{45}$, then $\frac{dy}{dx} =$?

(b) If $f(x) = sin(4 - 1/\sqrt[3]{x})$, then $f'(x) =$?

(c) If $f(x) = x\sqrt{1 - x^2}$, then $f'(x) =$?

(d)

$$\lim_{t \to \infty} \frac{|t + 2| + sin(t^2)}{5 - 4t} =$$

(e)

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

(15) 3. We motivated the limit definition of the derivative

(*) $$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

by tangent lines. Draw an appropriate picture and explain in your own words how the limit definition (*) is related to a tangent line.

(20) 4. True or False. (You must give at least one reason for your answer in a complete sentence. An answer alone is worth zero.)
(a) If $f(x) \neq 0$ and $f'(x) \neq 0$, then $\frac{d}{dx}(1/f(x)) = 1/f'(x)$.

(b) If $f(x)$ is differentiable for all real x, and with $|f(x)| \leq 1$ for all real x, then $|f'(x)| \leq 1$ for all real x.