Math 1251 Exam 2 February 23, 1995 Your Name _____
Professor Stanton

Directions: You may use your notes, books, and calculators. This exam has 8 problems with the point values indicated. Circle your answer to the multiple choice questions. 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.

(10) 1. If $f(x) = e^{-x^2 ln(x)}$, then $f'(x) =$
(a) $e^{-x^2 ln(x)}(-2xln(x))$
(b) $e^{-2xln(x)}$
(c) $e^{-x^2 ln(x)}(-x)$
(d) x^{-x^2}
(e) none of the above.

(10) 2. If $x\,tan^{-1}(y) = y^2$, then $\frac{dy}{dx}=$
(a) $x/(1+y^2) + tan^{-1}(y)$
(b) $(2y - tan^{-1}(y))(1+y^2)/x$
(c) $tan^{-1}(y)/(2y - \frac{x}{1+y^2})$
(d) $x/(2y(1+y^2))$
(e) none of the above.

(10) 3. If $f(x) = x\,e^{2x}$ then $f''(1) =$
(a) $8e^2$
(b) e^2
(c) 0
(d) $3e^2$
(e) none of the above.

(10) 4.

$$\lim_{x\to\infty} \frac{tan^{-1}(x)(2e^{2x} + ln(x))}{\sqrt{x} + e^{2x}} =$$

(a) 0
(b) 2
(c) 1
(d) π
(e) does not exist.

(10) 5. The best linear approximation to $y = \sqrt{x}$ at $x = 4$ is
(a) $y = x$
(b) $y - 2 = x - 4$
(c) $y - 4 = x - 2$
(d) $y - 2 = (x-4)/4$
(e) none of the above.

(10) 6. A population of bacteria is exponentially decaying. In one hour the population decreases from 2000 to 1500. What is the population after 2.5 additional hours?

(10) 7. A gas is trapped in a balloon at a constant temperature. It is known that the volume, V, and the pressure P of such a gas are related by $PV = c$, where c is a fixed constant. The volume of the balloon is increasing at the constant rate of 4 ml/sec. Find the rate of change of the pressure with respect to time when the pressure is 2 and the volume is 5.

(10) 8. Give an explicit function $f(x)$ such that

$$\lim_{x\to\infty} \frac{f(x)}{x} = 0 \quad \text{and} \quad \lim_{x\to\infty} \frac{f(x)}{ln(x)} = \infty.$$