NAME _____ Rec. Instr._____

Signature _____ Rec. Time_____

ANALYTIC GEOMETRY AND CALCULUS II
EXAM I
February 17, 1998

Show all work for full credit. You may use a calculator, but no books or notes.

	1	2	3	4	5	total
points per page						

(14) 1. Use L'Hôpital's rule to evaluate the limits.

(a) $\lim_{x\to 1} \dfrac{\sqrt{x^2+3}-2}{x-1}$

(b) $\lim_{x\to 0}(1+\sin(x))^{\frac{1}{x}}$

(21) 2. Evaluate the derivative. DO NOT SIMPLIFY.

(a) $y = \dfrac{\arcsin(x)}{x}$

(b) $y = \log_5(2^t + 1)$

(c) $x = (t + e^t)^t$

(14) 3. Evaluate the integrals.

(a) $\displaystyle\int e^{2x}\sqrt{e^{2x}-1}\,dx$

(b) $\displaystyle\int \frac{1}{x\,ln(x)}\,dx$

(10) 4. Find the area under the curve $y = \dfrac{1}{x^2+9}$ between $x = 0$ and $x = 3$.

(11) 5. Solve for y as a function of x if

$$\frac{dy}{dx} = x^2 y - x^2 \quad \text{and} \quad y(0) = 3.$$

(10) 6. Recall that the force of gravity satisfies

$$F = G \cdot \frac{m_1 \cdot m_2}{r^2} = \frac{k}{r^2}.$$

Compute the amount of work done in lifting a 3 ton satellite into an orbit 1,000 miles above the surface of the earth. (Use 4,000 miles as the radius of the earth.)

(10) 7. A colony of bacteria grows exponentially, taking 3 hours to double. Originally, 100 bacteria were present.

(a) Write a differential equation describing the change in the population of bacteria.

(b) Write the population as a function of time.

(10) 8. A ball is dropped off of the roof of a building. The acceleration of gravity is 32 feet/sec^2, but friction also decelerates the ball by an amount proportional to the velocity of the ball. Write a differential equation describing the change in the velocity of the ball. (DO NOT SOLVE.)