NAME _____ Rec. Instr._____

Signature _____ Rec. Time_____

CALCULUS 2
EXAM I
February 16, 1999

Show all work for full credit. No calculators, books or notes are allowed. The point value of each problem is given in the margin.

problem	1	2	3	4	5	6	total
points							
points possible	18	24	12	18	12	16	100

(18) 1. Find the derivatives of the following functions. (Do not simplify your answers.)

(a) $y = e^{\sin^2 x}$

(b) $y = \ln\left(\sqrt[3]{\dfrac{x+1}{x^2+2}}\right)$

(c) $y = x^{(e^x)}$

(24) 2. Evaluate the following integrals.

(a) $\displaystyle\int \frac{x\,dx}{4x^2+1}$

(b) $\displaystyle\int \frac{dx}{4x^2+1}$

(c) $\displaystyle\int_{-\sqrt{2}/2}^{\sqrt{3}/2} \frac{dx}{\sqrt{1-x^2}}$

(12) 3. It is known that, in the course of 550 years, 3/4 of a sample of an isotope of dendrobium will be lost by means of radioactive decay.

(a) Find a formula for the amount A of dendrobium (in grams, say) remaining from an initial amount A_0 after t years.

(b) Determine the half-life of dendrobium.

Remark: I know, you don't have a calculator. So, your answers will have to be expressed using the *ln* of various numbers.

(18) 4. Evaluate the following limits.

(a) $\lim_{x \to 0} \dfrac{x+1}{\cos x}$

(b) $\lim_{x \to 0} \dfrac{e^{2x}-1}{e^{3x}+1}$

(c) $\lim_{x \to \infty} (2x+3)^{1/x}$

(12) 5. Find the length of the curve $y = \cosh x$, from $x = 0$ to $x = 1$.
[Hint: At one point in the problem it will be useful to know the identity: $\cosh^2 x - \sinh^2 x = 1$]. Use the back of the preceding page if you need more room to work with.

(16) 6. Find the volume of the solid obtained by revolving the graph of $y = \sin x$, from $x = 0$ to $x = \pi$, around the y-axis. [For full credit you will need to set up the problem clearly, including a labelled diagram which shows the "volume element" for this problem.]