NAME ______________________ Rec. Instr. ______________________
Signature ______________________ Rec. Time ______________________

CALCULUS 2
EXAM I
September 22, 1998

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	total
points						
points possible	12	24	16	36	12	100

(15) 1. Find the volume obtained by revolving the region between the $x-$ axis, the graph of $y = e^{x^2}$, and the lines $x = 0$ and $x = 1$, around the $y-$ axis.

(24) 2. Find the derivatives of the following functions.

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

(b) $y = \ln(\tan^{-1} 2x)$

(c) $y = \sin(\sinh x)$

(16) 3. Evaluate the following limits.

(a) $\lim\limits_{x \to 0} \dfrac{\ln(1+x)}{x}$

(b) $\lim\limits_{x \to 0} (1+x)^{1/x}$

(36) 4. Find the definite or indefinite integrals.

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

(b) $\displaystyle\int_0^3 \frac{dx}{9+x^2}$

(c) $\displaystyle\int \frac{dx}{x\sqrt{x^6-1}}$

(d) $\displaystyle\int \sinh^2 x \cosh\, x\, dx$

(12) 5. Recall Newton's law of cooling: the rate at which an object cools is proportional to the difference $T - A$, where $T = T(t)$ is the temperature of the object at time t, and A is the (constant) temperature of the surrounding medium.

$$\frac{dT}{dt} = k(T - A)$$

Suppose $k = .3$, $T_0 = 100$ and $A = 30$ (temperatures being measured in degrees centigrade). Find T as a function of t.