Math 125, Midterm #2, 11/20/03

Name: _____
Section: _____

Write your final answer to each question in the space provided to the right. You must show your work to receive credit for a correct answer. Partial credit will be awarded. You may use a non-graphing calculator and one 8 1/2 x 11 sheet of **handwritten** notes.

You are assumed to know the indefinite integrals of the functions listed below. To receive credit, *all other integrals must be worked out.*

- Powers and exponentials x^a and e^x.
- The 6 basic trig functions: $\sin x$, $\cos x$, $\tan x$, $\cot x$, $\sec x$, and $\csc x$.
- Derivatives of the basic trig functions: $\sec^2 x$, $\csc^2 x$, $\sec x \tan x$, $\csc x \cot x$.
- Functions obtained from these by a linear change of variable, e.g. e^{ax}, $\sin(x+b)$, etc.

1. Evaluate

$$\int \sin^2 y \cos^2 y \, dy$$

_____ *(10)*

2. Evaluate

$$\int \frac{\sin\theta}{\sqrt{2-\cos^2\theta}}\,d\theta$$

(10)

3. Evaluate

$$\int_0^\infty \frac{e^t}{e^{2t}+3e^t+2}\,dt$$

(10)

4. Imagine that a straight hole has been bored to the center of the earth. A particle of mass m falling in such a hole would be attracted toward the earth's center with force $F = mgr/R$ where r is the distance of the particle from the center of the earth, R is the radius of the earth, and g is the acceleration due to gravity at the earth's surface.

   Find the work that would be done by gravity on the particle as it fell from the earth's surface to the center of the earth. _____ *(10)*

5. Find the length of the curve

$$y = \frac{x^2}{2} - \frac{\ln x}{4}$$

   between $2 \leq x \leq 4$. _____ *(10)*

6. A large pipe with a circular cross section of radius r is capped, laid horizontally and filled with water. Find the total force exerted on the cap. Use ρ to denote the density of water and g to denote the acceleration due to gravity. *(10)*