Last Name:______________
First Name:______________
ID:______________ Section:___

Math 2243,
March 24, 2004

There are 4 partial credit questions, each of them worth 25 points.
NO GRAPHIC CALCULATORS are permitted. GOOD LUCK!
1. Answer both of the following two questions:

a) Give an example of two square matrices $A$ and $B$ such that $AB \neq BA$

b) Find a nonzero matrix (a matrix for which not all the entries are zero) that satisfies the equality $A^2 = 0$. 
2. Let \( V = \{(x, y, z) \in \mathbb{R}^3 \mid x + y - z = 0\} \). Find an orthonormal basis in \( V \).
3. Consider the following subset of $\mathbb{R}^3$

$$S = \{(x, y, z) \in \mathbb{R}^3 | y^2 - xz = 0\}.$$ 

Is $S$ a vector subspace of $\mathbb{R}^3$? What is the span of this subset?
4. Let \( f(t) = t \), \( g(t) = e^t \) and \( h(t) = t^3 \). Are these three functions linearly independent? Is \( l(t) = t^2 \) in the subspace generated by \( f, g \) and \( h \)?