MACS 332 - July 27, 2006 **NAME:**
Quiz II - 30 minutes

In order to receive full credit, SHOW ALL YOUR WORK. Full credit will be given only if all reasoning and work is provided. Please enclose your final answers in boxes.

1. (10 Points) Define $M_{2\times 2}$ as the vector space of all two-by-two matrices with real entries. Let H be the subset of all real matrices of the form $\mathbf{A} = \begin{bmatrix} a & 0 \\ c & d \end{bmatrix}$. Is H a subspace of $M_{2\times 2}$? Justify your response.

2. (10 Points) Let λ be an eigenvalue of the invertible matrix $\mathbf{A}$. Show that λ^{-1} is an eigenvalue of $\mathbf{A}^{-1}$.

3. (10 Points) Given that,

$$\mathbf{A} = \begin{bmatrix} 2 & 0 \\ 1 & 0 \end{bmatrix}.$$

Determine a diagonal decomposition, $\mathbf{PDP}^{-1}$, of $\mathbf{A}$.

4. (10 Points) Which of the following matrices are diagonalizable?

$$\mathbf{A} = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 3 \end{bmatrix}, \quad \mathbf{B} = \begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}, \quad \mathbf{C} = \begin{bmatrix} 2 & 0 & 0 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}.$$

Explain.