Math 260
Spring 2014
Exam 5

Name:

1. 20 pts. each The matrix

$$\mathbf{A} = \begin{bmatrix} 2 & 0 & -2 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}.$$

is diagonalizable.

(a) Find the characteristic equation of $\mathbf{A}$, and use it to find the eigenvalues of $\mathbf{A}$.

(b) For each eigenvalue of $\mathbf{A}$ find the corresponding eigenvectors.

(c) Find an invertible matrix $\mathbf{P}$ and a diagonal matrix $\mathbf{D}$ such that $\mathbf{P}^{-1}\mathbf{A}\mathbf{P} = \mathbf{D}$.

2. 40 pts. Beginning with the vector $\mathbf{v}_1$, use the Gram-Schmidt Orthonormalization Process to obtain an orthonormal basis for the subspace of $\mathbb{R}^4$ spanned by the following vectors:

$$\mathbf{v}_1 = \begin{bmatrix} 1 \\ 0 \\ 1 \\ 0 \end{bmatrix}, \quad \mathbf{v}_2 = \begin{bmatrix} 3 \\ 0 \\ 2 \\ 0 \end{bmatrix}, \quad \mathbf{v}_3 = \begin{bmatrix} 2 \\ 1 \\ -1 \\ 3 \end{bmatrix}.$$