SI Session: Exam III Review
Mondays: 3:00 PM – 4:30 PM
Tuesdays: 1:30 PM – 3:00 PM
Thursdays: 1:30 PM – 3:00 PM
Room 1239 SNAD

Prof. McCurdy : Linear Algebra
Fall 2008
SI Leader : Neil Jody

[1] Find the characteristic polynomial, eigenvalues, and a basis for each eigenspace for $A = \begin{bmatrix} 4 & 2 \\ 2 & 7 \end{bmatrix}$.

[2] Find the determinant of $\begin{bmatrix} 8 & 3 & 0 & 5 \\ 5 & 3 & 1 & -2 \\ 2 & 2 & 0 & 5 \\ 12 & 6 & 2 & -4 \end{bmatrix}$.

[3] Answer the following:

(a) How can you tell whether a matrix is diagonalizable?

(b) Suppose $\lambda = 5$ is an eigenvalue of the 5×5 matrix A with a basis consisting of 3 eigenvectors associated with the eigenspace E_5. What are the possibilities for the algebraic multiplicity of $\lambda = 5$?

(c) What is a *unit vector*?

[4] Consider the vectors $\vec{v}_1 = \begin{bmatrix} 1 \\ -2 \\ 1 \end{bmatrix}$, $\vec{v}_2 = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$, $\vec{v}_3 = \begin{bmatrix} -5 \\ -2 \\ 1 \end{bmatrix}$.

(a) Verify that the vectors form an orthogonal set.

(b) Write the vector $\vec{w} = \begin{bmatrix} -14 \\ -6 \\ 8 \end{bmatrix}$ as a linear combination of $\vec{v}_1$, $\vec{v}_2$, and $\vec{v}_3$.

[5] Suppose that A is a 3×3 matrix and $\det A = 5$. Find the determinant of each of the following:

(a) the matrix obtained by exchanging the first and third rows of A.

(b) A^{-1}

(c) $2A$

[6] The number $\lambda = 3$ is an eigenvalue of the matrix $A = \begin{bmatrix} 2 & -2 & 3 \\ -2 & -1 & 6 \\ 2 & 4 & -3 \end{bmatrix}$.

Find a basis for the corresponding eigenspace.

[7] Consider the following subspace of $\mathbb{R}^3$: $V = Span\left\{\begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix}\right\}$. Find a basis for $V^{\perp}$.

[8] Let $\vec{u}_1 = \begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix}$, $\vec{u}_2 = \begin{bmatrix} -1 \\ -3 \\ 3 \end{bmatrix}$, $W = Span\{\vec{u}_1, \vec{u}_2\}$, and $\vec{y} = \begin{bmatrix} 14 \\ -38 \\ -8 \end{bmatrix}$.

Write $\vec{y}$ as the sum of a vector in W and a vector orthogonal to W.

[9] Diagonalize the matrix $A = \begin{bmatrix} 2 & 1 & 2 \\ 0 & 3 & 2 \\ 0 & 1 & 4 \end{bmatrix}$.