MATRIX ALGEBRA FINAL EXAM REVIEW ADDITIONAL PROBLEMS

2005 SPRING

(1) Find the standard matrix for the projection onto the plane

$$P = \{[x, y, z]^T \in \mathbb{R}^3 | x - y + z = 0\}$$

in $\mathbb{R}^3$

(a) by using the formula for the orthogonal projection in Theorem 6.3.8.

(b) by considering the eigenvalues and eigenvectors of the projection. (i.e. find a diagonalization of the standard matrix, and compute the product.)

(2) Find the standard matrix for the projection across the subspace

$$\text{span}\left(\begin{bmatrix} 1 \\ 1 \\ 0 \\ -1 \end{bmatrix}, \begin{bmatrix} 1 \\ -1 \\ 1 \\ 0 \end{bmatrix}\right)$$

in $\mathbb{R}^4$.

(3) Find the standard matrix for a rotation through 30° $(\frac{\pi}{6})$ around the line

$$\text{span}\left(\begin{bmatrix} 2 \\ 1 \\ -2 \end{bmatrix}\right)$$

(in either direction).