HW MATH227/8

1. Use the type of arguments given in Example 8 page 196 to calculate the eigenvalues and eigenvectors of T.
(a) $T : R^2 \longrightarrow R^2$ is the reflection about the x-axis.
(b) $T : R^2 \longrightarrow R^2$ is the reflection about the line $y = x$.
(c) $T : R^2 \longrightarrow R^2$ is the orthogonal projection on the x-axis.

2. Use the type of arguments given in Example 8 page 196 to calculate the eigenvalues and eigenvectors of T.
(a) $T : R^3 \longrightarrow R^3$ is the reflection about the yz-plane.
(b) $T : R^3 \longrightarrow R^3$ is the orthogonal projection on the xz-plane.
(c) $T : R^3 \longrightarrow R^3$ is the dilation by a factor of 2.

3. Find the eigenvalues of the following matrices:

$$(a)\ \begin{bmatrix} 3 & 0 \\ 8 & -1 \end{bmatrix} \quad (b)\ \begin{bmatrix} 10 & -9 \\ 4 & -2 \end{bmatrix} \quad (c)\ \begin{bmatrix} 0 & 3 \\ 4 & 0 \end{bmatrix}$$

$$(d)\ \begin{bmatrix} -2 & -7 \\ 1 & 2 \end{bmatrix} \quad (e)\ \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \quad (f)\ \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

4. Find the eigenvalues of the following matrices:

$$(a)\ \begin{bmatrix} 4 & 0 & 1 \\ -2 & 1 & 0 \\ -2 & 0 & 1 \end{bmatrix} \quad (b)\ \begin{bmatrix} -2 & 0 & 1 \\ -6 & -2 & 0 \\ 19 & 5 & -4 \end{bmatrix}$$

$$(c)\ \begin{bmatrix} 5 & 0 & 1 \\ 1 & 1 & 0 \\ -7 & 1 & 0 \end{bmatrix} \quad (d)\ \begin{bmatrix} 5 & 6 & 2 \\ 0 & -1 & -8 \\ 1 & 0 & -2 \end{bmatrix}$$

5. Find the eigenvalues of A^{25} for

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

6. Find $det(A)$ given that A has $p(\lambda)$ as its characteristic polynomial.
(a) $p(\lambda) = \lambda^3 - 2\lambda^2 + \lambda + 5$. (b) $p(\lambda) = \lambda^4 - \lambda^3 + 7$.

7. Find a matrix P that diagonalizes A, and determine $P^{-1}AP$.

$$A = \begin{bmatrix} -1 & 4 & -2 \\ -3 & 4 & 0 \\ -3 & 1 & 3 \end{bmatrix}$$

8. Compute A^{11}, where

$$A = \begin{bmatrix} -1 & 7 & -1 \\ 0 & 1 & 0 \\ 0 & 15 & -2 \end{bmatrix}$$