1. Write the following systems of equations in matrix form $A\mathbf{x} = \mathbf{b}$. [Do not solve.]

(a).
$$\begin{array}{rcrcr} 3x & + & 2y & = & 6 \\ x & - & 5y & = & 4 \end{array}$$

(b).
$$\begin{array}{rcrcr} -2x & - & y & = & 0 \\ 4x & + & 3y & = & -1 \end{array}$$

2. Write the following matrix equations as a system of linear equations. [Do not solve.]

(a). $\begin{bmatrix} 2 & 1 \\ 4 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ 0 \end{bmatrix}$

(b). $\begin{bmatrix} 0 & -3 & 1 \\ 2 & 5 & -2 \\ 1 & 1 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -1 \\ 2 \\ -2 \end{bmatrix}$

3. Is $\begin{bmatrix} 1 \\ 3 \end{bmatrix}$ an eigenvector of $\begin{bmatrix} 1 & -1 \\ 6 & -4 \end{bmatrix}$. If so, find the eigenvalue.

4. Is $\begin{bmatrix} 3 \\ -2 \\ 1 \end{bmatrix}$ an eigenvector of $\begin{bmatrix} -4 & 3 & 3 \\ 2 & -3 & -2 \\ -1 & 0 & -2 \end{bmatrix}$. If so, find the eigenvalue.

5. Find the eigenvalues only of the given matrix.

(a). $\begin{bmatrix} -4 & 2 \\ 3 & 1 \end{bmatrix}$

(b). $\begin{bmatrix} 4 & 0 & -1 \\ 0 & 4 & -2 \\ 1 & 0 & 2 \end{bmatrix}$

6. Find an eigenvector corresponding to each of the listed eigenvalues for the given matrix.

(a). $A = \begin{bmatrix} 3 & 0 \\ 2 & 1 \end{bmatrix}, \lambda = 1, 3$

(b). $A = \begin{bmatrix} 1 & -3 \\ -4 & 5 \end{bmatrix}, \lambda = -1, 7$

(c). $A = \begin{bmatrix} 4 & 0 & 1 \\ -2 & 1 & 0 \\ -2 & 0 & 1 \end{bmatrix}, \lambda = 1, 2, 3$

7. Using the steps given in class, find the eigenvalues and associated eigenvectors for the following matrices.

(a). $\begin{bmatrix} 2 & 7 \\ 7 & 2 \end{bmatrix}$

(b). $\begin{bmatrix} -4 & 2 \\ 6 & 7 \end{bmatrix}$

(c). $\begin{bmatrix} 8 & 2 \\ 3 & 3 \end{bmatrix}$