By repeating the same process for $\lambda = 1$, the eigenvector is

$$x_2 = \begin{bmatrix} -1 \\ 2 \end{bmatrix}$$

(b) The characteristics equation is

$$(2 - \lambda)(\lambda - 4)(\lambda - 1) = 0.$$ 

The eigenvalues are 1, 2, 4. The eigenvector corresponding to $\lambda = 1$ is $x_1 = \begin{bmatrix} -1 \\ 1 \\ 1 \end{bmatrix}$.

The eigenvector corresponding to $\lambda = 2$ is $x_2 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$.

The eigenvector corresponding to $\lambda = 4$ is $x_3 = \begin{bmatrix} 7 \\ -2 \\ 1 \end{bmatrix}$.

(c) The characteristics equation is

$$\lambda^3 - 5\lambda^2 + 2\lambda + 8 = 0.$$ 

The eigenvalues are $-1, 2, 4$.

The eigenvector corresponding to $\lambda = -1$ is $x_1 = \begin{bmatrix} -8 \\ 10 \\ 7 \end{bmatrix}$.

The eigenvector corresponding to $\lambda = 2$ is $x_2 = \begin{bmatrix} 1 \\ -2 \\ 1 \end{bmatrix}$.

The eigenvector corresponding to $\lambda = 4$ is $x_3 = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$.

(d) The characteristics equation is

$$(\lambda - 3)(\lambda - 1)(\lambda - 4) = 0.$$ 

The eigenvalues are 1, 3, 4.

The eigenvector corresponding to $\lambda = 1$ is $x_1 = \begin{bmatrix} -1 \\ 2 \\ 2 \end{bmatrix}$.

The eigenvector corresponding to $\lambda = 3$ is $x_2 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$.

The eigenvector corresponding to $\lambda = 4$ is $x_3 = \begin{bmatrix} 7 \\ -2 \\ 1 \end{bmatrix}$. 