$$m_1 = \begin{pmatrix} 2 & 2 \\ 1 & 3 \end{pmatrix}$$

$$\begin{vmatrix} 2-\lambda & 2 \\ 1 & 3-\lambda \end{vmatrix} = 0$$

$$(2-\lambda)(3-\lambda) - 1 \times 2 = 0$$

$$\lambda^2 - 5\lambda + 4 = 0$$

$$D = 25 - 16 = 9$$

$$\lambda_1 = \frac{5+3}{2 \times 1} = 4$$

$$\lambda_2 = \frac{5-3}{2} = 1$$

$$\begin{cases} -2x_1 + 2y_1 = 0 \\ 1x_1 - 1y_1 = 0 \end{cases} \Rightarrow x = y$$

$$\begin{cases} x_1 + 2y_1 = 0 \\ x_1 + 2y_1 = 0 \end{cases} \Rightarrow x = -2y$$

$$\bar{u}_1 = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad \bar{u}_2 = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$$

$$m_2 = \begin{pmatrix} 4 & 1 & -1 \\ 1 & 4 & -1 \\ -1 & -1 & 4 \end{pmatrix}$$

$$\begin{vmatrix} 4-\lambda & 1 & -1 \\ 1 & 4-\lambda & -1 \\ -1 & -1 & 4-\lambda \end{vmatrix} = 0$$

$$(4-\lambda)((4-\lambda)(4-\lambda) - (-1)(-1)) - 1(1(4-\lambda) - (-1)(-1)) +$$

$$+ (-1(1(-1) - (4-\lambda) \times (-1))) = 0;$$

$$(4-\lambda)(16 - 4\lambda - 4\lambda + \lambda^2 - 1) - (4 - \lambda - 1) + \left(\overset{\lambda-3}{\cancel{-1-(\lambda-4)}}\right) = 0;$$

$$(4-\lambda)(\lambda^2 - 8\lambda + 15) - (3-\lambda) + \lambda \cancel{+} 3 = 0;$$

$$(-\lambda^3 + 12\lambda^2 - 47\lambda + 60) - 3 + \lambda + \lambda - 3 = 0;$$

$$-\lambda^3 + 12\lambda^2 - 45\lambda + 54 = 0$$

$$\lambda_1 = 6 \quad \lambda_2 = 3 \quad \lambda_3 = 3$$

$$\begin{array}{ccc} & & \\ \multicolumn{3}{c}{\begin{pmatrix} -2 & 1 & -1 \\ 1 & -2 & -1 \\ -1 & -1 & -2 \end{pmatrix}} \\ x_1 & x_2 & x_3 \end{array} \quad \begin{pmatrix} 0 & -3 & -3 \\ 1 & -2 & -1 \\ -1 & -1 & -2 \end{pmatrix} \quad \begin{pmatrix} 0 & -3 & -3 \\ 0 & -3 & -3 \\ -1 & -1 & -2 \end{pmatrix} \quad \begin{pmatrix} 0 & -3 & -3 \\ -1 & -1 & -2 \end{pmatrix}$$

$$-3x_2 = 3x_3$$

$$-x_1 - x_2 = 2x_3$$

$$x_2 = -x_3$$

$$x_1 = -x_3 \qquad \bar{x}_1 = \begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix}$$

$$\lambda_2 = 3 \to \begin{array}{ccc} \multicolumn{3}{c}{\begin{pmatrix} 1 & 1 & -1 \\ 1 & 1 & -1 \\ -1 & -1 & 1 \end{pmatrix}} \\ x_1 & x_2 & x_3 \end{array} \quad \begin{pmatrix} 1 & 1 & -1 \\ -1 & -1 & 1 \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 \\ -1 & -1 & 1 \end{pmatrix} \quad (-1 \quad -1 \quad 1)$$

$$(1 \quad 1 \quad -1) \qquad \bar{x}_2 = \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}$$