$$f(x,y) = (x-3\,;\,y+2)\begin{pmatrix} 1 & -3 \\ -3 & 1 \end{pmatrix}\begin{pmatrix} x-3 \\ y+2 \end{pmatrix} + 0$$

b) $\det\begin{pmatrix} 1-\lambda & -3 \\ -3 & 1-\lambda \end{pmatrix} = (1-\lambda)^2 - 9 = 1 - 2\lambda + \lambda^2 - 9 =$

$$= \lambda^2 - 2\lambda - 8 = (\lambda - 4)(\lambda + 2)$$

$$\underline{\underline{\begin{array}{l} \lambda_1 = 4 \\ \lambda_2 = -2 \end{array}}}$$

$\underline{\lambda = 4:}$ $\begin{pmatrix} -3 & -3 \\ -3 & -3 \end{pmatrix}$

$$\left(\begin{array}{cc|c} -3 & -3 & 0 \\ -3 & -3 & 0 \end{array}\right) \sim \left(\begin{array}{cc|c} 1 & 1 & 0 \\ 0 & 0 & 0 \end{array}\right) \quad v = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$$

$\underline{\lambda = -2:}$ $\begin{pmatrix} 3 & -3 \\ -3 & 3 \end{pmatrix}$

$$\left(\begin{array}{cc|c} 3 & -3 & 0 \\ -3 & 3 & 0 \end{array}\right) \sim \left(\begin{array}{cc|c} 1 & -1 & 0 \\ 0 & 0 & 0 \end{array}\right) \quad w = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & -3 \\ -3 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 1 \\ -1 & 1 \end{pmatrix}\begin{pmatrix} 4 & 0 \\ 0 & -2 \end{pmatrix}\begin{pmatrix} \frac{1}{2} & -\frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} \end{pmatrix}$$

$$\begin{pmatrix} 1 & 1 \\ -1 & 1 \end{pmatrix}^{-1} \Rightarrow \left(\begin{array}{cc|cc} 1 & 1 & 1 & 0 \\ -1 & 1 & 0 & 1 \end{array}\right) \sim \left(\begin{array}{cc|cc} 1 & 1 & 1 & 0 \\ 0 & 2 & 1 & 1 \end{array}\right) \sim \left(\begin{array}{cc|cc} 1 & 1 & 1 & 0 \\ 0 & 1 & \frac{1}{2} & \frac{1}{2} \end{array}\right) \sim \left(\begin{array}{cc|cc} 1 & 0 & \frac{1}{2} & -\frac{1}{2} \\ 0 & 1 & \frac{1}{2} & \frac{1}{2} \end{array}\right)$$