



16. Determine whether  $\mathbf{w} = \begin{bmatrix} 11 & -1 \\ -1 & 2 \end{bmatrix}$  is in the span of

$$\mathbf{v}_1 = \begin{bmatrix} 2 & 0 \\ -1 & 2 \end{bmatrix}, \mathbf{v}_2 = \begin{bmatrix} -1 & 3 \\ 3 & 0 \end{bmatrix}, \mathbf{v}_3 = \begin{bmatrix} 5 & 5 \\ 0 & 0 \end{bmatrix}, \mathbf{v}_4 = \begin{bmatrix} 3 & 4 \\ 1 & 1 \end{bmatrix}$$

and, if it is, express  $\mathbf{w}$  as a linear combination of  $\mathbf{v}_1$ ,  $\mathbf{v}_2$ ,  $\mathbf{v}_3$ , and  $\mathbf{v}_4$ .

19. Find the eigenvalues and eigenvectors of the linear operator  $T(x, y) = (2x + 2y, 5y - x)$ .