

[gex51] Matrix operations XII: eigenvectors of asymmetric matrix

Consider the constant, asymmetric matrix familiar from [gex42],

$$\mathbf{N} = \begin{pmatrix} 2 & 1 & 1 \\ 3 & 2 & 5 \\ 1 & 4 & 2 \end{pmatrix}.$$

- (a) Use the command `N[Eigenvalues[]]` to determine the three eigenvalues of \mathbf{N} .
 - (b) Use the command `N[Eigenvectors[]]` to the matrix \mathbf{N} and its transpose to determine the (non-normalized and complex) right eigenvectors and left eigenvectors.
 - (c) Use the `Norm` command to normalize the six eigenvectors.
 - (d) Demonstrate that each left eigenvector is orthogonal to two right eigenvectors and vice versa. They form a bi-orthogonal set.
- Create a Mathematica notebook to carry out these tasks.

Solution: