

[gex47] Matrix operations VIII: eigenvectors of symmetric matrix

Consider the constant, symmetric matrix,

$$\mathbf{S} = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 2 & 1 \\ 3 & 1 & 3 \end{pmatrix}.$$

- Use the command `N[Eigenvalues[]]` to determine the three (real) eigenvalues of \mathbf{S} .
 - Reproduce these eigenvalues by applying the command `NSolve` to the characteristic polynomial `Det[$\mathbf{S} - \lambda\mathbf{I}$]`, where \mathbf{I} is the identity matrix.
 - Use the command `N[Eigenvectors[]]` to determine the three (non-normalized) eigenvectors of \mathbf{S} .
 - Demonstrate that these eigenvectors are mutually orthogonal.
 - Use the `Norm` command to normalize the three eigenvectors.
- Create a Mathematica notebook to carry out these tasks.

Solution: