

[gex48] Matrix operations IX: eigenvectors of Hermitian matrix

Consider the constant, symmetric matrix,

$$\mathbf{H} = \begin{pmatrix} 1 & 3i & 2 \\ -3i & 2 & -i \\ 2 & i & 3 \end{pmatrix}.$$

- Use the command `N[Eigenvalues[]]` to determine the three (real) eigenvalues of \mathbf{H} .
 - Reproduce these eigenvalues by applying the command `NSolve` to the characteristic polynomial $\text{Det}[\mathbf{H} - \lambda\mathbf{I}]$, where \mathbf{I} is the identity matrix.
 - Use the command `N[Eigenvectors[]]` to determine the three (non-normalized and complex) eigenvectors of \mathbf{H} .
 - 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: