

University of Lethbridge
Department of Mathematics and Computer Science
MATH 1410 - Tutorial #11
Wednesday, April 4

1. Let $A = \begin{bmatrix} 2 & -2 \\ 1 & 5 \end{bmatrix}$. Compute $A\vec{u}_i$ for $i = 1, 2, 3, 4$, where:

$$\vec{u}_1 = \begin{bmatrix} 1 \\ 4 \end{bmatrix}, \vec{u}_2 = \begin{bmatrix} 4 \\ -2 \end{bmatrix}, \vec{u}_3 = \begin{bmatrix} 2 \\ -2 \end{bmatrix}, \vec{u}_4 = \begin{bmatrix} 3 \\ -3 \end{bmatrix}.$$

Which of the above were eigenvectors? What are the eigenvalues of A ?

2. Verify that the matrix $Z = \begin{bmatrix} 3 & 1 \\ -2 & 1 \end{bmatrix}$ has eigenvalues $\lambda_1 = 2 + i$ and $\lambda_2 = 2 - i$ with corresponding eigenvectors $\vec{x}_1 = \begin{bmatrix} 1 + i \\ -2 \end{bmatrix}$, $\vec{x}_2 = \begin{bmatrix} 1 \\ -1 - i \end{bmatrix}$.

3. The matrix $A = \begin{bmatrix} 3 & 2 & 1 \\ 1 & 4 & 1 \\ 1 & 2 & 3 \end{bmatrix}$ has characteristic polynomial $c_A(\lambda) = -(\lambda - 2)^2(\lambda - 6)$. Find the eigenvalues of A , and the corresponding eigenvectors.

4. Compute the eigenvalues of the matrix $A = \begin{bmatrix} 3 & -1 & 2 \\ 0 & 3 & 1 \\ 0 & 4 & 3 \end{bmatrix}$

5. Compute the eigenvalues and eigenvectors of the matrix $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$.