

Lecture 15: Eigenvalues and Eigenvectors
Basics

$$\det(\lambda - \lambda I) = 0$$

↪ eigenvalues

Find eigenvalues of $\begin{bmatrix} 3 & -1 \\ -1 & 3 \end{bmatrix}$

$$\det\left(\begin{bmatrix} 3 & -1 \\ -1 & 3 \end{bmatrix} - \lambda \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}\right) = 0$$

$$\det\left(\begin{bmatrix} 3 & -1 \\ -1 & 3 \end{bmatrix} - \begin{bmatrix} \lambda & 0 \\ 0 & \lambda \end{bmatrix}\right) = 0$$

$$\det\left(\begin{bmatrix} 3-\lambda & -1 \\ -1 & 3-\lambda \end{bmatrix}\right) = 0$$

$$(3-\lambda)(3-\lambda) - (-1)(-1) = 0$$

$$\lambda^2 - 6\lambda + 8 = 0$$

$$(\lambda-2)(\lambda-4) = 0$$

$$\lambda = 2, 4$$

∴ Eigenvalues: $\lambda = 2$ and $\lambda = 4$ #