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Eigenvalues & Eigenvectors:

$$T: \underline{V} \longrightarrow \underline{V} \quad \text{linear transf.}^{\equiv}$$

λ eigenvalue of T if

egⁿ. \longrightarrow $T(v) = \lambda v$ for some $v \neq 0$ in V .

eigenvector

eigenvalue

axis of transf.ⁿ

stretching factor

How to find them:

For $T: \mathbb{R}^n \longrightarrow \mathbb{R}^n$ given by $n \times n$ matrix

$$A = \begin{bmatrix} a_{11} & \dots & a_{1n} \\ \vdots & & \vdots \\ a_{n1} & \dots & a_{nn} \end{bmatrix}$$

$$T(v) = Av,$$

$$Av = \lambda v$$

\Downarrow

$$(A - \lambda I_n)v = 0$$

• λ is an eigenvalue \iff

$$\det(A - \lambda I_n) = 0$$

characteristic eqⁿ.

• v is an eigenvector (with eigenvalue λ) \iff
 v is a nonzero solⁿ of system of linear eqⁿs:

$$(A - \lambda I_n)v = 0$$