

verifying eigenvectors

How to check if a given \vec{v} is the eigenvector of a given matrix A

- multiply \vec{v} by A and see if $A\vec{v}$ is a scalar multiple of \vec{v} , i.e. $A\vec{v} = \lambda\vec{v}$
- what happens when a matrix hits a vector?

example

Consider matrix $A = \begin{bmatrix} 2 & 2 \\ -4 & 8 \end{bmatrix}$ and vector $\vec{v} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ and $\vec{w} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$.

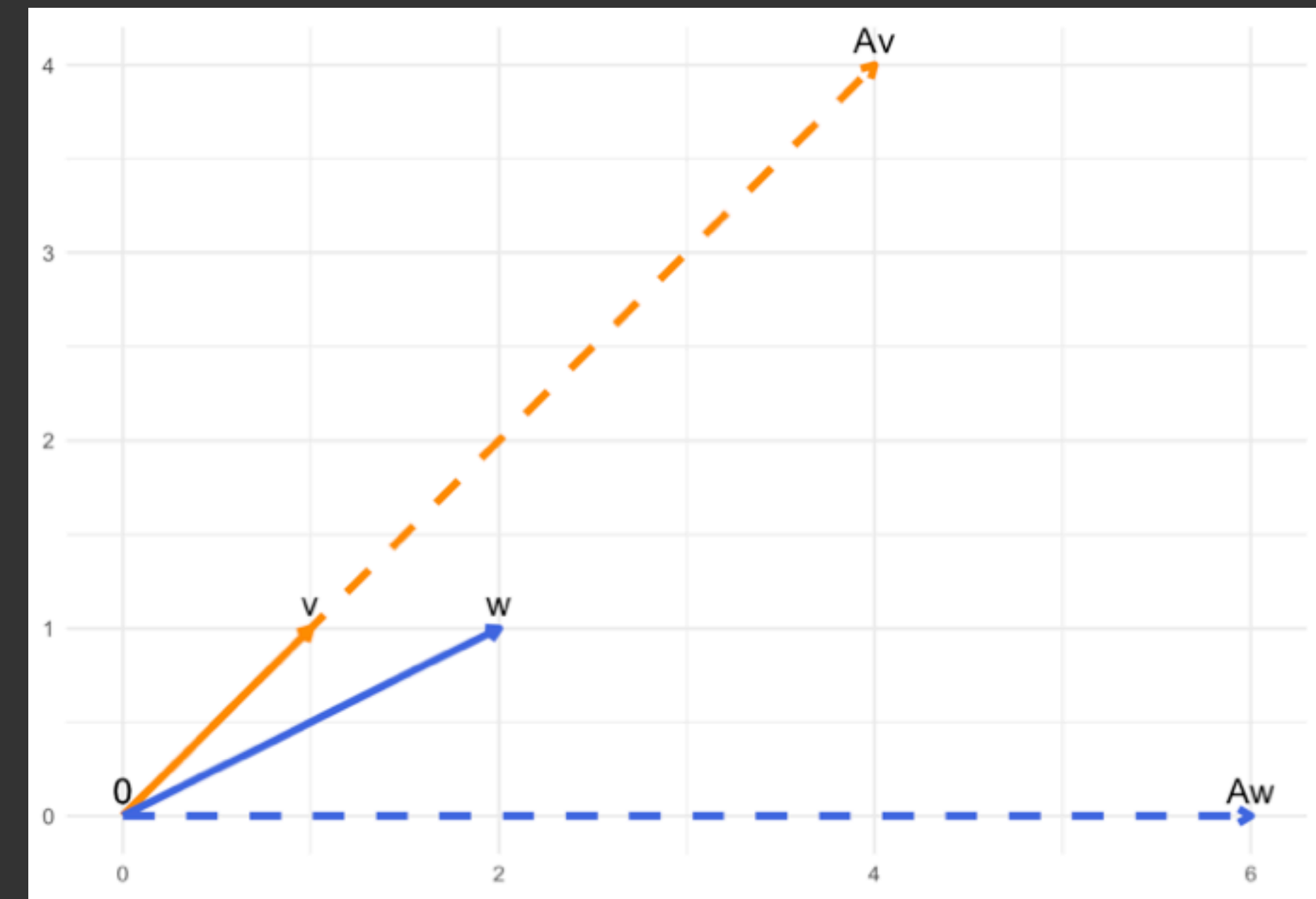
Which are eigenvectors? What are their eigenvalues?

$$A\vec{v} = \begin{bmatrix} 2 & 2 \\ -4 & 8 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 4 \\ 4 \end{bmatrix} = 4\vec{v}$$

$\implies \vec{v}$ is an eigenvector of A

$$A\vec{w} = \begin{bmatrix} 2 & 2 \\ -4 & 8 \end{bmatrix} \begin{bmatrix} 2 \\ 1 \end{bmatrix} = \begin{bmatrix} 6 \\ 0 \end{bmatrix}$$

$\implies \vec{w}$ is not an eigenvector of A



verifying eigenvectors

exercise 1

Consider the matrix $A = \begin{bmatrix} 0 & 6 & 8 \\ 1/2 & 0 & 0 \\ 0 & 1/2 & 0 \end{bmatrix}$ and vectors $\vec{v}_1 = \begin{bmatrix} 16 \\ 4 \\ 1 \end{bmatrix}$ and $\vec{v}_2 = \begin{bmatrix} 2 \\ 2 \\ 2 \end{bmatrix}$.

Which are eigenvectors? What are their eigenvalues?