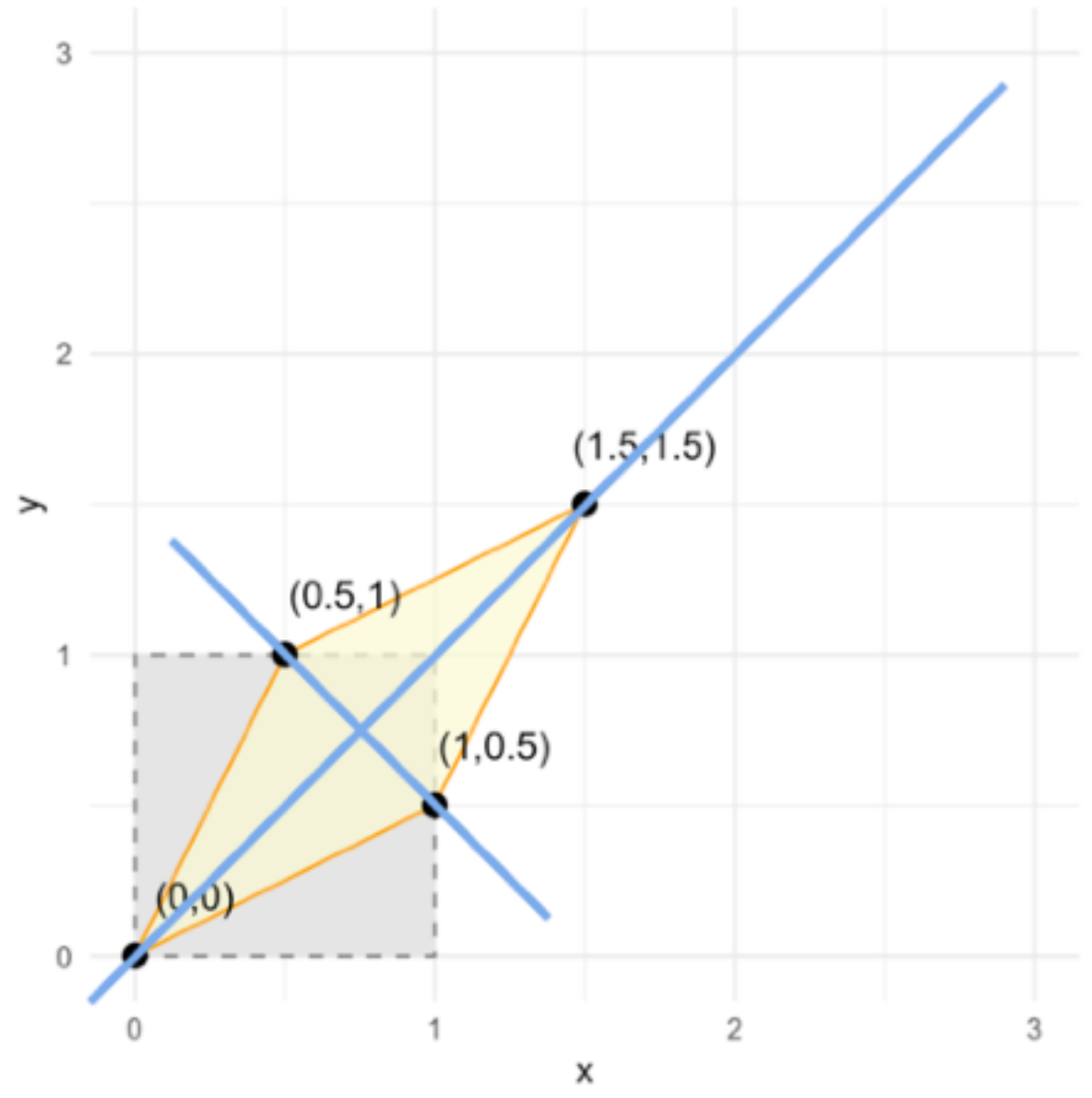
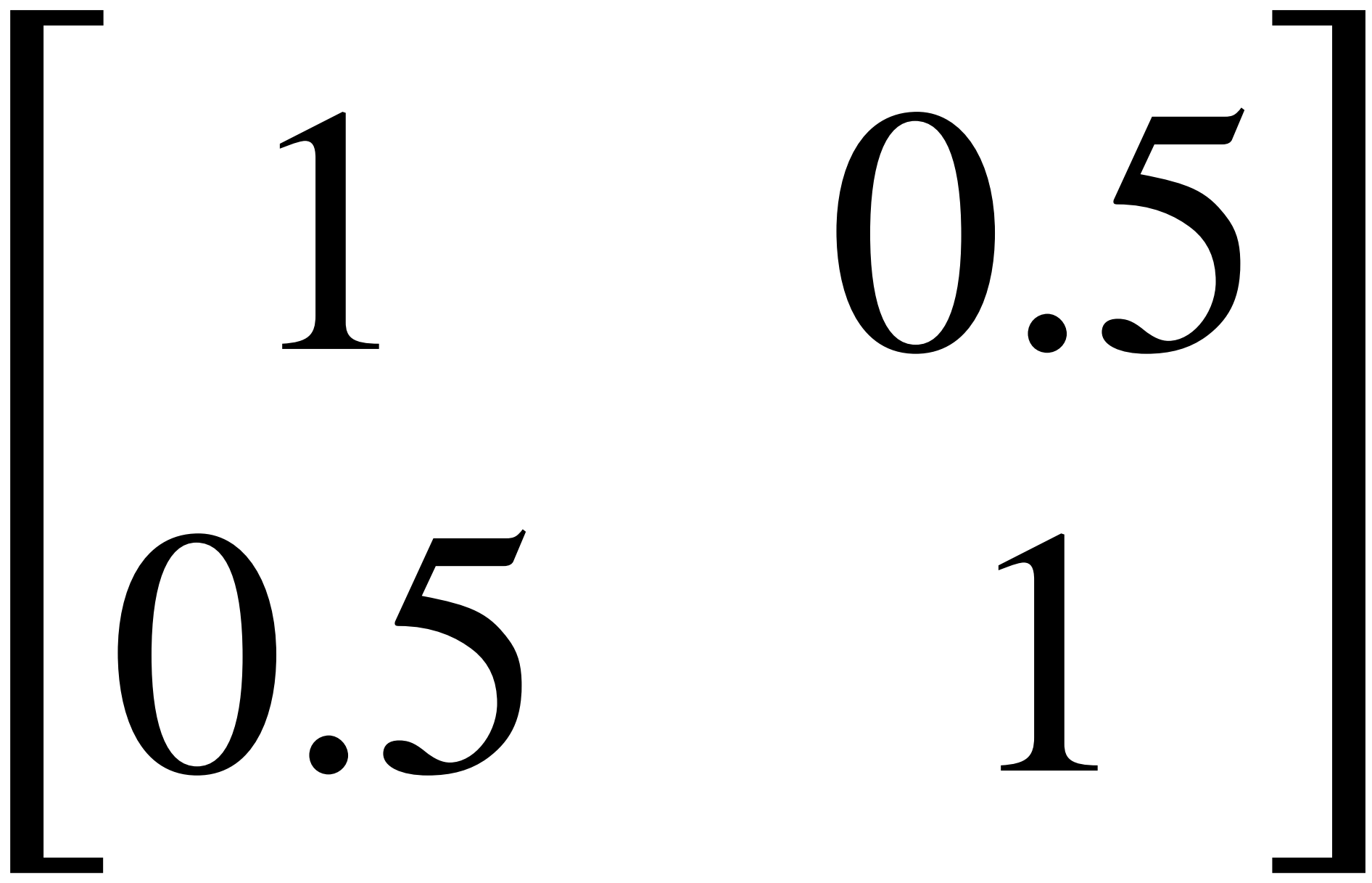
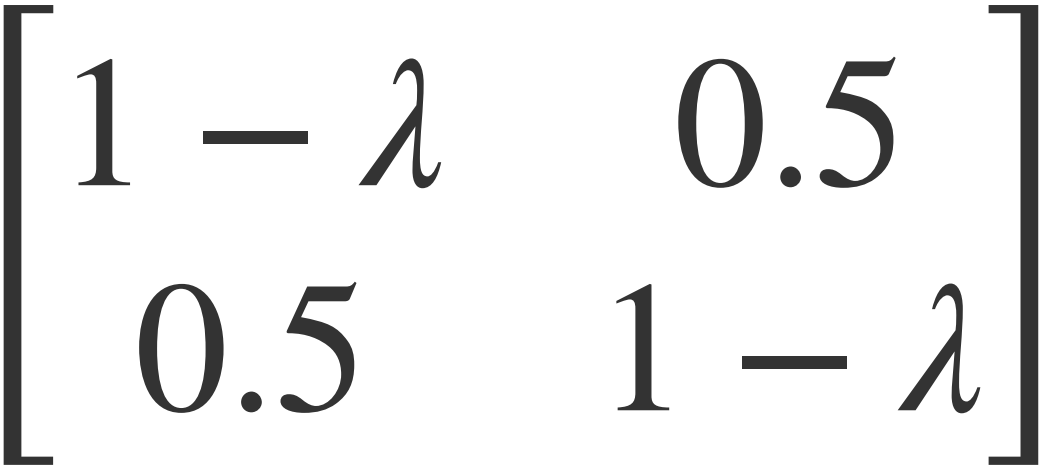
Eigendecomposition

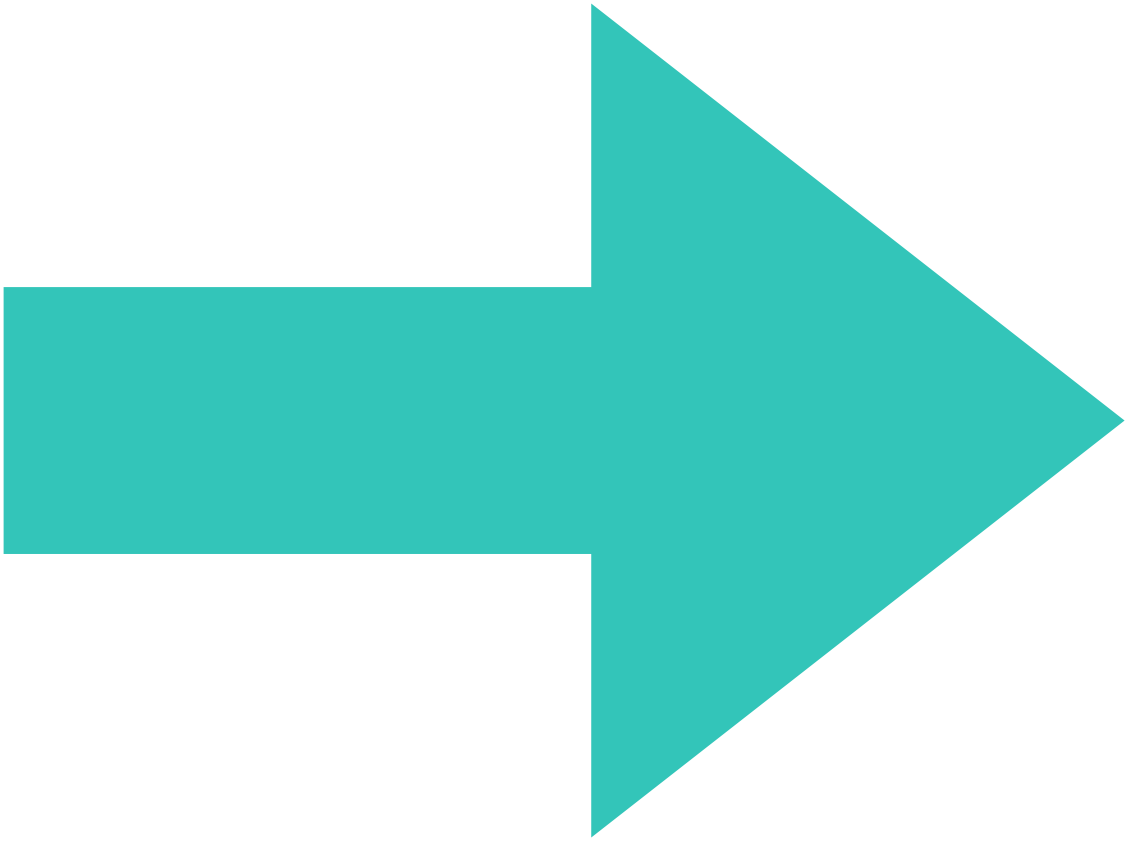

3
2
1
0
y
0
1
2
3
x
(1.5,1.5)
(0.5,1)
(1,0.5)
(0,0)

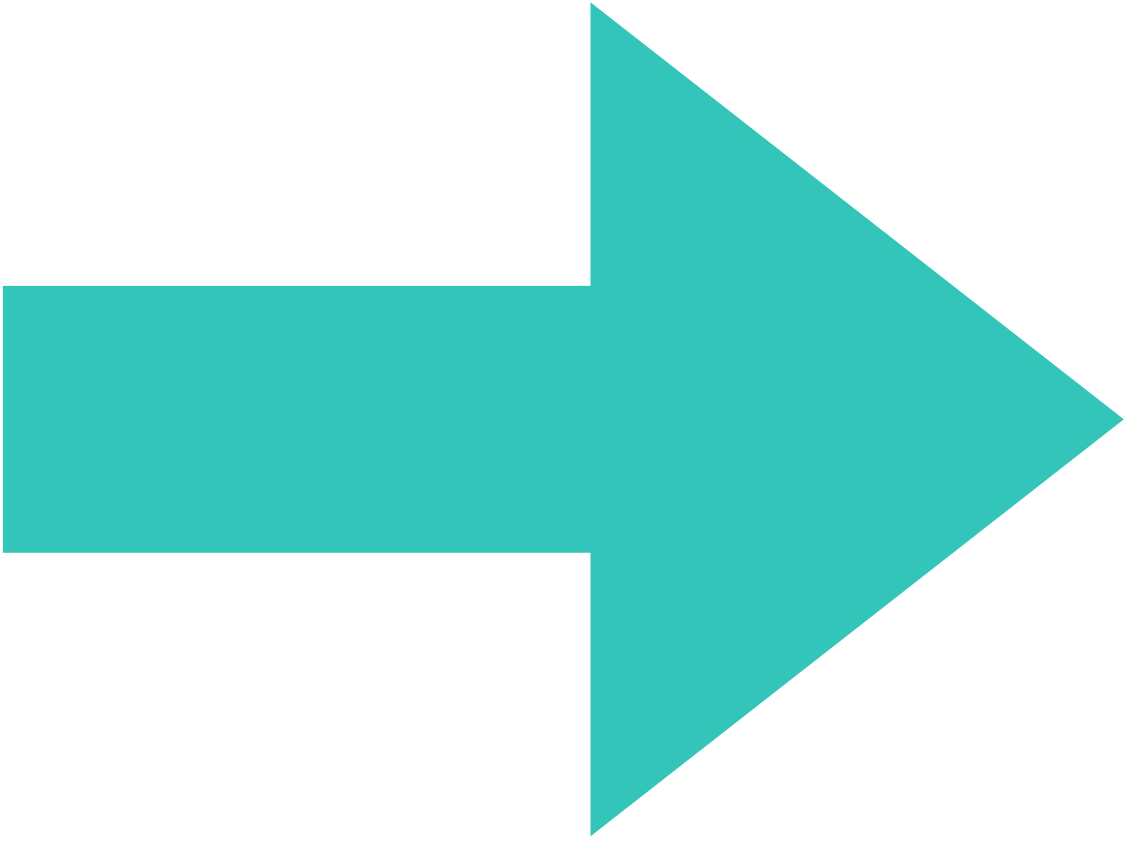




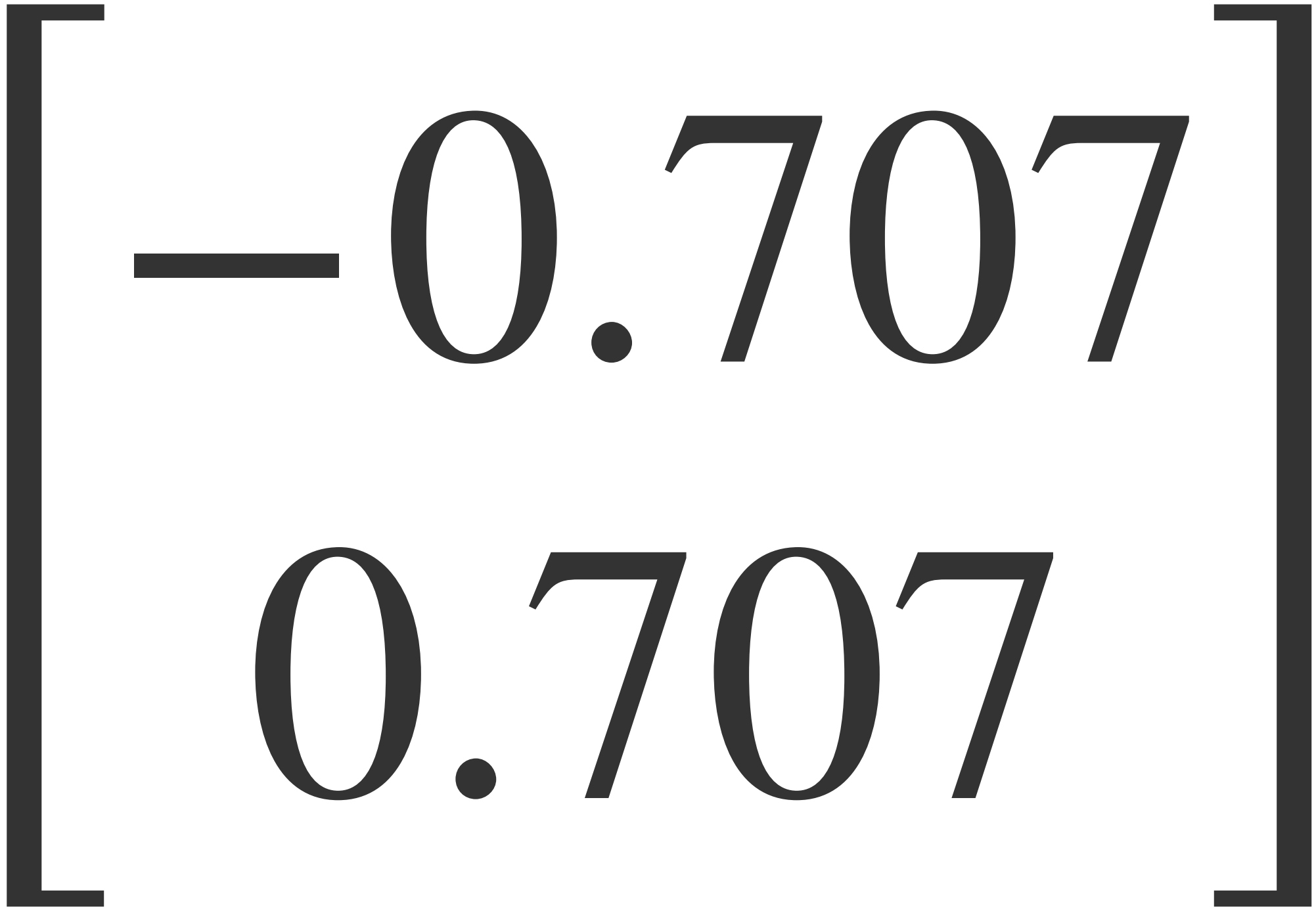
plug eigenvalues back and get **eigenvectors** (direction)

$$\lambda = [1.5, 0.5]$$





$$\begin{bmatrix} 0.707 \\ 0.707 \end{bmatrix}$$

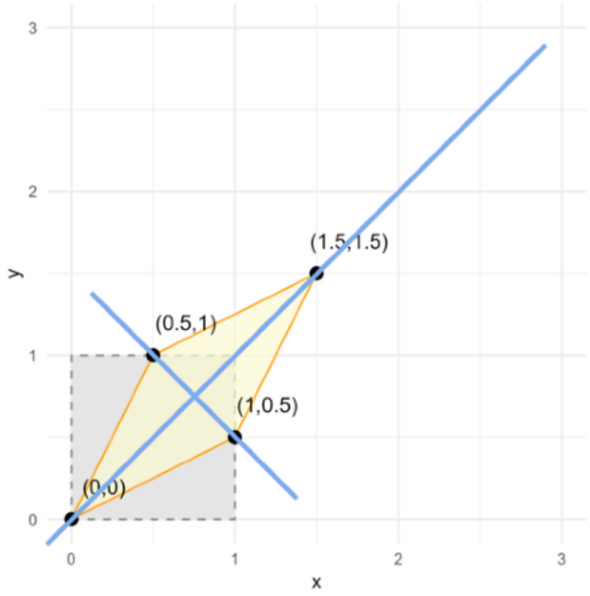

[
−0.707
0.707
]

Eigendecomposition

$$\begin{bmatrix} 1 & 0.5 \\ 0.5 & 1 \end{bmatrix} \qquad Ax = \lambda x$$

plug eigenvalues back and get **eigenvectors** (direction)

$$\lambda = [1.5,\ 0.5] \rightarrow \begin{bmatrix} 1-\lambda & 0.5 \\ 0.5 & 1-\lambda \end{bmatrix}$$



$$\rightarrow \begin{bmatrix} 0.707 \\ 0.707 \end{bmatrix} \qquad \begin{bmatrix} -0.707 \\ 0.707 \end{bmatrix}$$

Example

in PCA we perform eigendecomposition on the covariance matrix of the data