

## 1 | Export

<https://www.overleaf.com/project/606b2fa8be363f9005d8ce03>

## 2 | Exercise 7

Suppose  $T \in \mathcal{L}(V)$  has a diagonal matrix  $A$  with respect to some basis of  $V$  and that  $\lambda \in \mathbb{F}$ . Prove that  $\lambda$  appears on the diagonal of  $A$  precisely  $\dim E(\lambda, T)$  times.

## 3 | Proof

We will show that for each eigenvalue  $\lambda$ , there are at least  $E(\lambda, T)$  occurrences of that eigenvalue and at most  $E(\lambda, T)$  occurrences.

Suppose  $\lambda$  is on the diagonal  $m$  times. Each of those occurrences corresponds to where the diagonal matrix sends a (linearly independent) basis eigenvector, which implies that the basis of  $V$  has at least  $m$  eigenvectors corresponding to  $\lambda$ . These  $m$  eigenvectors can be extended to a basis of  $E(\lambda, T)$ , implying that  $\dim E(\lambda, T) \geq m$ .

3.1 | **TODO Suppose  $\lambda$  is on the diagonal  $m$  times. show that there are at most  $\dim E(\lambda, T)$  occurrences on the diagonal**