# 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(;l, T) occurances on the diagonal