Source:

1 | sources source

1.1 | linear algebra done right (Axler 5.A)

2 | motivation

The simplest non-trivial invariant subspaces are one-dimensional. Let U be a one-dimensional invariant subspace under T, then

$$Tu \in U : u \in U$$

Because $U = \text{span}(u)$, this implies

$$Tu = \lambda u$$

which defines an eigenvalue (λ) and eigenvector(u) pair.