

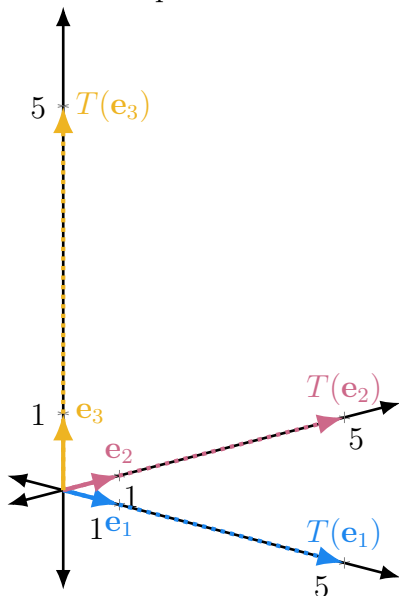
## MATH 262 - Homework 7.1

7. Arguing geometrically, find all eigenvectors and eigenvalues of the linear transformation:

Scaling by 5 in  $\mathbb{R}^3$

Then find an eigenbasis if you can, and thus determine whether the given transformation is diagonalizable.

Below is a plot of a vector and its scaled counterpart.



Notice  $T(\mathbf{e}_1) = A\mathbf{e}_1 = 5\mathbf{e}_1$ . This follows the form described in the definition of an eigenvalue i.e. a  $\lambda$  such that  $A\vec{v} = \lambda\vec{v}$ . Thus, the eigenvalue is 5. This also holds for  $\mathbf{e}_2$  and  $\mathbf{e}_3$ . Therefore,  $\mathbf{e}_1$ ,  $\mathbf{e}_2$ , and  $\mathbf{e}_3$  form an eigenbasis and all vectors in  $\mathbb{R}^3$  are eigenvectors of this transformation.