

Eigenvectors of a Linear Transformation

1. Let $C^\infty(\mathbb{R})$ denote the vector space of infinitely differentiable functions on the real numbers. Let $T: C^\infty(\mathbb{R}) \rightarrow C^\infty(\mathbb{R})$ be the linear transformation defined by $T(f) = \frac{df}{dx} - 2f$. Which of the following are eigenvectors of T ?

(a) $\sin(x)$

(b) e^x

(c) $5x + 2$

(d) e^{2x}

Complex Eigenvalues

1. Diagonalize the following matrix.

$$A = \begin{bmatrix} 3 & 4 \\ -2 & -1 \end{bmatrix}$$