## Learning Objective

- Determine if a scalar is an eigenvalue of a matrix
- Determine if a vector is an eigenvector of a matrix
- Understand how to find eigenvectors corresponding to a given eigenvalue
- Understand how to find a basis for an eigenspace corresponding to an eigenvalue
- Understand how to find the eigenvalues of a triangular matrix

## Eigenvectors and Eigenvalues

**Definition:** Let $A$ be an $n \times n$ matrix.

An ______________________ of $A$ is a **nonzero** vector $\mathbf{x}$ such that $A\mathbf{x} =$ _________ for some scalar ______.

A scalar $\lambda$ is called an ______________________ of $A$ if there is a **nontrivial** solution $\mathbf{x}$ of the equation $A\mathbf{x} = \lambda\mathbf{x}$; such an $\mathbf{x}$ is called an ______________________ corresponding to ______.

**Remark:** $\lambda$ is an eigenvalue of an $n \times n$ matrix $A$ if and only if the equation ______________________ has a nontrivial solution. The set of all solutions to this equation is called the ______________________ of $A$ corresponding to ______.

**Theorem 5.1:** The eigenvalues of a triangular matrix are the entries on its ________________________________.

**Theorem 5.2** If $\mathbf{v}_1, \ldots, \mathbf{v}_r$ are eigenvectors that correspond to distinct eigenvalues $\lambda_1, \ldots, \lambda_r$ of an $n \times n$ matrix $A$, then the set $\{\mathbf{v}_1, \ldots, \mathbf{v}_r\}$ is ___________________ __________________________.