12.1.3 What You Will Learn

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Upon completion of this unit, you should be able to

- Determine whether a given vector is an eigenvector for a particular matrix.
- Find the eigenvalues and eigenvectors for small-sized matrices.
- Identify eigenvalues of special matrices such as the zero matrix, the identity matrix, diagonal matrices, and triangular matrices.
- Interpret an eigenvector of A, as a direction in which the “action" of A, Ax, is equivalent to x being scaled without changing its direction. (Here scaling by a negative value still leaves the vector in the same direction.) Since this is true for any scalar multiple of x, it is the direction that is important, not the length of x.
- Compute the characteristic polynomial for 2×2 and 3×3 matrices.
- Know and apply the property that a matrix has an inverse if and only if its determinant is nonzero.
- Know and apply how the roots of the characteristic polynomial are related to the eigenvalues of a matrix.
- Recognize that if a matrix is real valued, then its characteristic polynomial has real valued coefficients but may still have complex eigenvalues that occur in conjugate pairs.
- Link diagonalization of a matrix with the eigenvalues and eigenvectors of that matrix.
- Make conjectures, reason, and develop arguments about properties of eigenvalues and eigenvectors.
- Understand practical algorithms for finding eigenvalues and eigenvectors such as the power method for finding an eigenvector associated with the largest eigenvalue (in magnitude).

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