Definition 1. Let A be a square $n \times n$ matrix. The eigendecomposition of A is

$$A = Q\Lambda Q^{-1} \tag{1}$$

where A is the square $n \times n$ matrix whose ith column is the eigenvector q_i of A and Λ is the diagonal matrix whose diagonal elements are the corresponding eigenvalues.

0.1 Computing Power Series

Eigendecomposition allows for the easy computation of the power series of a matrix. Let

$$f(x) = \sum_{i=0} a_i x^i$$

then

$$f(A) = Qf(\Lambda)Q^{-1}$$

which reduces to calculating f on each of the eigenvalues.