For 2×2 matrices with complex eigenvalues $(p \pm iq)$, the trajectories of the discrete dynamical system

1) are outward spirals if $r > 1$
2) are inward spirals if $r < 1$
3) are closed loops if $r = 1$

the r being from $re^{i\theta}$

An orthogonal matrix is a square matrix with orthonormal columns (and real entries).

If M is an orthogonal $n \times n$ matrix, then $M^T M = I_n$, the identity matrix

From this we can get $M^{-1} = M^T$

A matrix is orthogonally diagonalizable if we can write it as SDS^{-1} where S is orthogonal and D is diagonal.

The Spectral Theorem states that A is orthogonally diagonalizable if and only if A is symmetric.

There are 3 useful ways to think about orthogonally diagonalizable

1) SDS^{-1} where S is orthogonal, D is diagonal
2) there is an orthonormal eigenbasis
3) the matrix is diagonalizable over $\mathbb{R}$ and the eigenspaces are orthogonal to each other

Projections and reflections over subspaces in any dimension are orthogonally diagonalizable