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Q1. What are Eigenvalues and Eigenvectors? How are they related to the Eigen-D
approach?Explain with an example.
Eigenvalues are the special set of scalar values that is associated with the
set of linear equations most probably in the matrix equations. The eigenvector
are also termed as characteristic roots. It is a non-zero vector that can be
changed at most by its scalar factor after the application of linear
transformations.

Q2. What is eigen decomposition and what is its significance in linear algebra
Ans 2-Eigendecomposition provides us with a tool to decompose a matrix by
discovering the eigenvalues and the eigenvectors. This operation can prove
useful since it allows certain matrix operations to be easier to perform and i
also tells us important facts about the matrix itself.



Q3. What are the conditions that must be satisfied for a square matrix to be
diagonalizable using the Eigen-Decomposition approach? Provide a brief proof t
support your answer.
Ans 3- a matrix is diagonalizable if and only if its nilpotent part is zero.
Put in another way, a matrix is diagonalizable if each block in its Jordan for
has no nilpotent part; i.e., one-by-one matrix.



Q4. What is the significance of the spectral theorem in the context of the
Eigen-Decomposition approach? How is it related to the diagonalizability of a
matrix? Explain with an example.
Ans 4-The spectral theorem, a major result in functional analysis, states that
any normal (A linear operator is normal if it is closed, densely defined, and
commutes with its adjoint.) operator on a Hilbert space H can be diagonalized,
i.e. it is unitarily equivalent to a multiplication operato


Q5. How do you find the eigenvalues of a matrix and what do they represent?
Ans -To find the eigenvalues of a square matrix A: Find its characteristic
equation using |A - λI| = 0, where I is the identity matrix of same order A.
Solve it for λ and the solutions would give the eigenvalues.


Q6. What are eigenvectors and how are they related to eigenvalues?
Ans-Eigenvalues are the special set of scalar values that is associated with
the set of linear equations most probably in the matrix equations. The
eigenvectors are also termed as characteristic roots. It is a non-zero vector
that can be changed at most by its scalar factor after the application of line
transformations



Q7. Can you explain the geometric interpretation of eigenvectors and eigenvalu
Ans-Geometrically, an eigenvector, corresponding to a real nonzero eigenvalue,
points in a direction in which it is stretched by the transformation and the
eigenvalue is the factor by which it is stretched. If the eigenvalue is
negative, the direction is reversed
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Q8. What are some real-world applications of eigen decomposition?
Ans 8-It is used in car design especially car stereo system and also in decoup



Q9. Can a matrix have more than one set of eigenvectors and eigenvalues?
Ans 9-Since a nonzero subspace is infinite, every eigenvalue has infinitely ma
eigenvectors. (For example, multiplying an eigenvector by a nonzero scalar giv
another eigenvector.)
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