Linear Algebra

1) **What is Plane?**
   A linear equation in three variables represents a plane. More technically, a plane is a flat geometric object which extends up to infinity.
2) **What are the possible cases to set a plane?**
   - No intersection at all.
   - Planes intersection in a line.
   - They can intersect in a plane.
   - All the three planes intersect at a point.
3) **What is matrix?**
   A matrix is a rectangular array of real numbers which is arranged in rows and columns.
   In simpler words, the matrix contains information about the intensity of pixels of the image in the form of rows and columns.
4) **What is order of matrix?**
   If a matrix has 3 rows and 4 columns, order of the matrix is 3*4 i.e. row*column.
5) **What is square matrix?**
   The matrix in which the number of rows is equal to the number of columns.
6) **What is Diagonal Matrix?**
   A matrix with all the non-diagonal elements equal to 0 is called a diagonal matrix.
7) **What is upper triangular Matrix?**
   A square matrix with all the elements below diagonal equal to 0.
8) **What is lower triangular matrix?**
   A square matrix with all the elements above the diagonal equal to 0.
9) **What is scaler matrix?**
   A square matrix with all the diagonal elements equal to some constant k.
10) **What is identity matrix?**
    A square matrix with all the diagonal elements equal to 1 and all the non-diagonal elements equal to 0.
11) **What is column matrix?**
    The matrix which consists of only 1 column. Sometimes, it is used to represent a vector.
12) **What is row Matrix?**
    A matrix consisting only of row.
13) **What is Trace?**
    It is the sum of all the diagonal elements of a square matrix.
14) **What are the basic operations on matrix?**
    - Addition
    - Scalar Multiplication
    - Transposition
    - Multiplication
    - Subtraction
    - Division

15) What is inverse of a Matrix?

For solving a large number of equations in one go, the inverse is used.

16) What is Determinant of a Matrix?

The determinant of a matrix is a number that is specially defined only for square matrices.

17) What is minor of matrix?

A "minor" is the determinant of the square matrix formed by deleting one row and one column from some larger square matrix.

18) What is cofactor of matrix?

A cofactor is the number you get when you remove the column and row of a designated element in a matrix, which is just a numerical grid in the form of a rectangle or a square.

19) What is Adjoint of a matrix?

Adjoin of a matrix is the transpose of its cofactor matrix.

20) How to find Inverse of matrix?

- Find out the adjoint of the matrix A.
- Multiply the adjoint matrix by the inverse of determinant of the matrix A.

21) What is an Eigenvectors?

- Vectors whose direction remains unchanged even after applying linear transformation with the matrix are called Eigenvectors for that particular matrix.

Note: Concept of Eigenvalues and Eigenvectors is applicable to square matrices only.

22) What is Eigenvalues?

The scalar that is used to transform an Eigenvector.

23) What is the use of Eigenvectors in Data Science?

The concept of Eigenvectors is applied in a machine learning algorithm Principal Component Analysis. Suppose you have a data with a large number of features i.e. it has a very high dimensionality. It is possible that there are redundant features in that data. Apart from this, a large number of features will cause reduced efficiency and more disk space. What PCA does is that it craps some of lesser important features. But how to determine those features? Here, Eigenvectors come to our rescue. Let's go through the algorithm of PCA. Suppose we have an 'n' dimensional data and we want to reduce it to 'k' dimensions. We will do it in steps.

- Data is mean normalized and feature scaled.
- We find out the covariance matrix of our dataset.
- We find out the Eigenvectors of the covariance matrix. You don't need to bother much about covariance matrix. It's an advanced concept of statistics. As we have data in 'n' dimensions, we will find 'n' Eigenvectors corresponding to 'n' Eigenvalues.
- We will select 'k' Eigenvectors corresponding to the 'k' largest Eigenvalues and will form a matrix in which each Eigenvector will constitute a column. We will call this matrix U

24) What is Singular Value Decomposition?

SVD is used to remove the redundant features in a data set. It is used to get rid of the redundant features present in our data.