Maths Pre-requisites for ML

1. Linear Algebra
    a. Vector spaces
    b. Basis vectors , Rank and linear independence
    c. Row and column spaces
    d. Matrix operations – sum, multiplication, inverse etc
    e. Eigen value and eigen vectors
    f. Singular value Decomposition
2. Calculus
    a. Integration and its interpretation as area under the curve
    b. Derivatives and their Geometric interpretation
    c. Sum, product and chain rule of derivatives
    d. First order and second order derivatives at minima and maxima
    e. Partial derivatives – Jacobian and Hessian Matrix
3. Statistics
    a. Basic distributions
        i. Binomial , Poisson, Negative Binomial , Geometric , Normal/Gaussian, power law, skew-normal etc
    b. Measurements –
        i. Parametric
            1. Mean , variance, standard deviation, covariance , correlation
        ii. Non-Parametric
            1. Median , IQR, Median absolute deviations, Rank, quantiles and percentile
    c. Derived distributions
        i. T, Chi squared and F
    d. Hypothesis tests
        i. Z test
        ii. T test
        iii. Chi-square test
        iv. Fisher's exact test
        v. Anova
        vi. Non-parametric - Mann whitney U test, Kruskal Wallis Test
    e. Distances and Similarities
        i. Euclidean Distance
        ii. Mahalanobis distance
        iii. Entropy and Cross Entropy
        iv. KL divergence and JS divergence, Earth Mover's Distance
    f. Other important topics
        i. likelihood and log likelihood
        ii. Bayes Theorem and conditional probability
        iii. Expectation maximization
        iv. Maximum likelihood estimate
        v. Negative sampling
        vi. Bootstrapping
        vii. Central limit theorem