Given data set (4 x 3) below X = {[1,2,2], [1,2,1], [3,2,1], [1,2,3]}, please answer the following:

1. The covariance matrix normalized by (n-1), where n is the number of features per sample.
2. How to select projection matrix, composed by projection vectors, to have the projected covariance matrix is a diagonal matrix?
3. What are principal components of X and their corresponding variances?