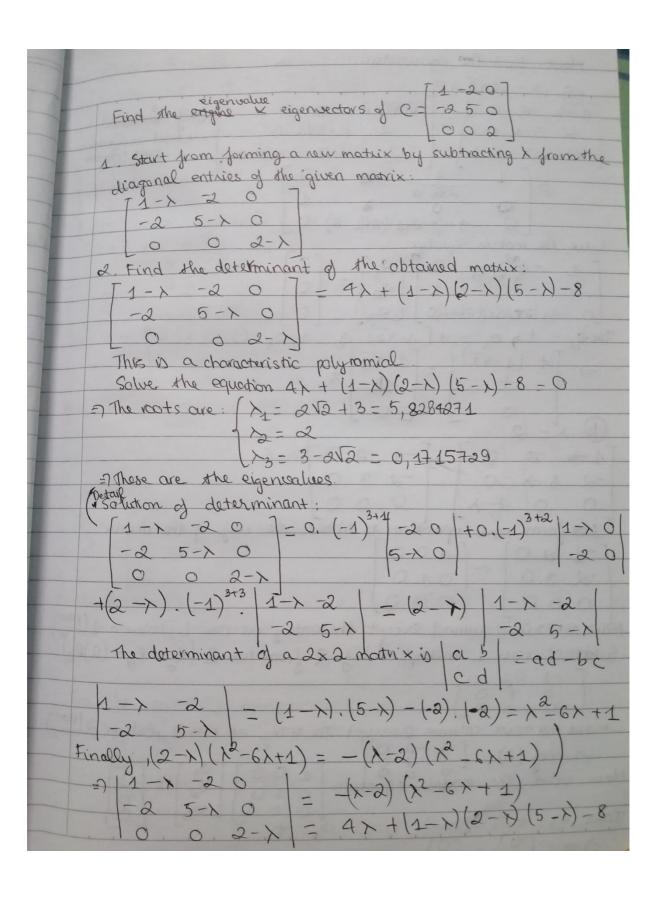
PCA computation

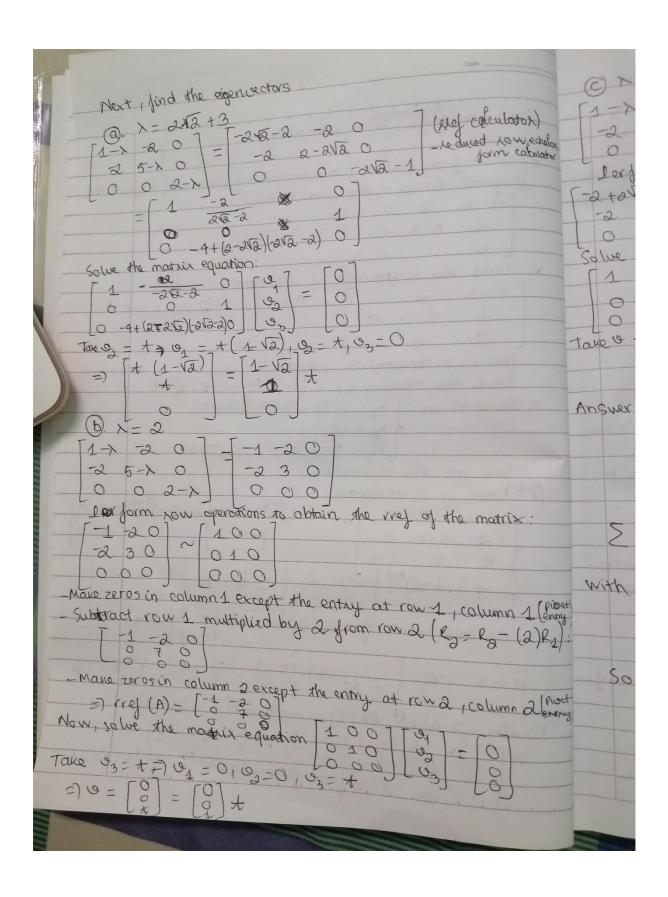
Suppose the random variables X_1 , X_2 , and X_3 have the covariance matrix:

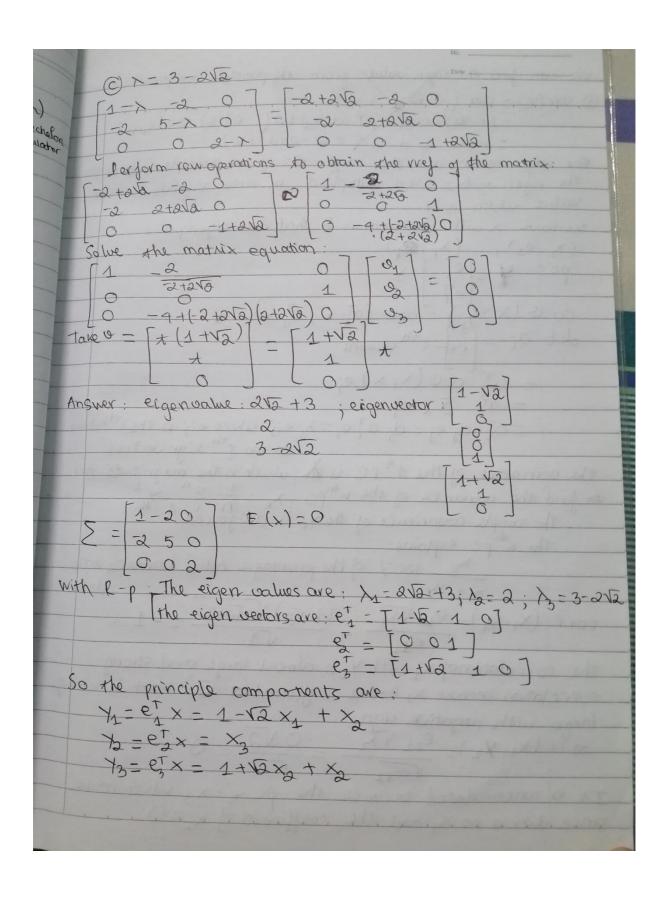
$$C = \begin{pmatrix} 1 & -2 & 0 \\ -2 & 5 & 0 \\ 0 & 0 & 2 \end{pmatrix}$$

Calculate (by hand, show detail work) the eigenvalue-eigenvector pairs and the principal components $Y_{1,}\,Y_2$ and Y_3 .

ANSWER







we can find the eigen values from the principle components. = (1-12)2 var(x) + (1)2 var(x) + 2 (1-15) (1) cov (x, x) 1 Var (Y1) = var (1-12) =3-21a 1/+ 16+(2-21a)(a) The eigen vectors are the coefficients of the principle components the eigen vectors when multiplied with vector x yields a scalar we have x with colo matrix E that has eigenpairs $(x_1, e_1) \qquad (x_1, e_p)$ $pc's \qquad y = \begin{bmatrix} e_1^T \\ e_1^T \end{bmatrix} \times$ $co \qquad (a_1^T \times , e_1^T \times)$ $det \qquad a_i = \begin{bmatrix} i & i & element \end{bmatrix}$ = at coo(x, x) e; = or djej=djarej= jeij where eij is the ith plement cut the jth eign vectors The variance of the 1st 2C is on which is the magnitude and to find the variance of the kthpc the i = 1 ki the kith pc explains: > 100% of the prentage total varion co in the data corr (x1, y1) = e11 V7 = (1-12) V2V2+3 = -1 The correlation of x with y is almost large and strong correlation because X1 has a coefficient (I-V2) which is kind of large with regarile sign.

corr (x1, x2) = e21 V2 = 0.12 = V51 It is uncorrelated because the pc to= x3 which make gense there is no x4 and the coefficient of x4 is 0