

## MA227 (Assignment-3)

Note:  $A$  is  $m \times n$  with  $\text{rank}(A) = n < m$ .

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1. Write a function *LSSNEqn.m* that takes a matrix  $A$  and vector  $b$ , and returns the least square solution of  $Ax = b$  by solving normal equation  $A^T A \hat{x} = A^T b$ . To solve the normal equation, first find decomposition of  $A^T A$  by using the built-in function `chol` and then use functions *FdSubs.m* and *BdSubs.m* (of Assignment 1) to find  $\hat{x}$ .
2. Write a function *GramSelf.m* that takes a matrix  $A$ , and returns  $Q$  and  $R$  such that  $A = QR$ . Use Gram-Schmidt procedure to obtain this  $QR$ -decomposition.
3. Write a function *HouseSelf.m* that takes a matrix  $A$ , and returns  $Q$  and  $R$  such that  $A = QR$ . Use Householder procedure to obtain this  $QR$ -decomposition.
4. Write a script file *A3P4.m* to find the least square solution of  $Ax = b$ , where  $A = \begin{bmatrix} 1 & 1 \\ 2 & 1 \\ 3 & 1 \end{bmatrix}$  and  $b = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}$  by the function *LSSNEqn.m*. Compare the result with the solution obtained by the built-in function `backslash`.