

More Review Problems

① Find a basis for V^\perp if V is spanned by $\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$

② Find an orthonormal basis of the V above.
What is this has to do with QR decomposition?

③ Find the projection matrix onto V . How about onto V^\perp ?
(Use in ①.)

④ What equations must be satisfied by b in order for

$$\begin{bmatrix} 1 & 1 \\ 2 & 3 \\ 0 & 1 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \end{bmatrix} \quad \text{to have a solution}$$

⑤ Find the unique solution x in the row space to

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 6 \\ 4 \end{bmatrix}$$

Can this system have only one solution for some right hand side?

⑥ If v is an eigenvector of A , is it also an eigenvector of $A^2, A^{-1}, A^2 + A^{-1}$?

⑦ What do you know about eigenvectors v_1, v_2, \dots, v_5 of some A for which the eigenvalues $\lambda_1, \dots, \lambda_5$ are distinct? What if A is symmetric?

⑧ For what matrices SVD coincides with diagonalization?

⑨ For a 5×3 matrix A , what are the possibilities for dimensions of $N(A), N(A^T), C(A), C(A^T)$?

⑩ For



mark/shade all a) $c\vec{u} + d\vec{v}$ with $c, d \geq 0$
b) $\frac{1}{2}\vec{u} + \frac{1}{2}\vec{v}$ c) $\frac{1}{4}\vec{u} + \frac{3}{4}\vec{v}$
d) $c\vec{u} + d\vec{v}$ with $c + d = 1$

⑪ What can you say about $A^T A$ if A is invertible?