Quiz 11 Consistency Matrix.

Ma322 Fall 2018 Avinash Sathaye

You are given

$$A = \begin{bmatrix} 1 & 2 & -1 \\ 1 & 1 & 1 \\ 2 & 3 & 0 \end{bmatrix} \text{ and } M = \begin{bmatrix} 1 & 2 & -1 & 1 & 0 & 0 \\ 0 & -1 & 2 & -1 & 1 & 0 \\ 0 & 0 & 0 & -1 & -1 & 1 \end{bmatrix}$$

where M is the REF of $(A|I)$. Answer the following questions.

- What is the consistency matrix (G) obtained from the above reduction for the linear system $(A|B)$? **Answer:** The row across from the zero row in M, so $G = \begin{bmatrix} -1 & -1 & 1 \end{bmatrix}$.

- Use the consistency matrix to determine all values of t for which $AX = B$ is solvable, when $B = \begin{bmatrix} 1+t \\ t \\ -t^2 \end{bmatrix}$. **Answer:** $GB = [-1 - 2t - t^2]$ and hence $t = -1$ is the only value which satisfies $GB = 0$.

- Write down at least one concrete vector $B = B_{3\times1}$ such that $AX = B$ is inconsistent. **Answer:** One obvious answer is $B = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$, since it gives $GB = [-1] \neq [0]$.

- For meditation Prove that $Col(A) = Nul(G)$ by using the properties of the consistency matrix G. Also, work out some simple examples by taking the transpose of A and finding its consistency matrix. The answer is related to