MATH221

problem discussed in class on September 24, 2019

True or False? If the only solution for $A\mathbf{x} = 0$ is $\mathbf{x} = 0$, then for each $\mathbf{b}$ the system $A\mathbf{x} = \mathbf{b}$ has only one solution.

As we discussed in class if the system $A\mathbf{x} = \mathbf{b}$ consistent, then the solution is unique. However the matrix A may be such that $A\mathbf{x} = \mathbf{b}$ has no solutions at all when $\mathbf{b} \neq 0$. Here is an example.

$$A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 0 \end{bmatrix}, \mathbf{b} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}.$$

While $A\mathbf{x} = 0$ has only one solution $A\mathbf{x} = \mathbf{b}$ has no solutions at all.