Matrices in Geometry 12.363

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Question: The system of linear equations $\mathbf{Ax} = \mathbf{0}$, where $\mathbf{A}$ is a $n \times n$ matrix, has a non-trivial solution ONLY if,

1) rank of $\mathbf{A} > n$
2) rank of $\mathbf{A} = n$
3) rank of $\mathbf{A} < n$
4) $\mathbf{A}$ is an identity matrix

Solution: For a system of linear equations $\mathbf{Ax} = \mathbf{0}$ to have a non-trivial solution, $\mathbf{A}$ has to be a singular matrix, this implies that

$$rank\,(\mathbf{A}) < n \tag{1}$$

which is the option 3).