

Exercises on the four fundamental subspaces

Problem 10.1: (3.6 #11. *Introduction to Linear Algebra: Strang*) A is an m by n matrix of rank r . Suppose there are right sides \mathbf{b} for which $A\mathbf{x} = \mathbf{b}$ has *no solution*.

- a) What are all the inequalities ($<$ or \leq) that must be true between m , n , and r ?
- b) How do you know that $A^T\mathbf{y} = \mathbf{0}$ has solutions other than $\mathbf{y} = \mathbf{0}$?

Problem 10.2: (3.6 #24.) $A^T\mathbf{y} = \mathbf{d}$ is solvable when \mathbf{d} is in which of the four subspaces? The solution \mathbf{y} is unique when the _____ contains only the zero vector.