

2017 Fall EE203001 Linear Algebra - Quiz 4

Name:

ID:

1. Given a m by n matrix A of rank r . What is the relation between the rank r , m and n when the number of solutions to $A\mathbf{x} = \mathbf{b}$ is
 - (a) 0 or 1, depending on \mathbf{b} space.(Please explain the relation between \mathbf{b} and A)
 - (b) ∞ , regardless of \mathbf{b} .
 - (c) 0 or ∞ , depending on \mathbf{b} space.(Please explain the relation between \mathbf{b} and A)
 - (d) 1, regardless of \mathbf{b} .

Ans:

- (a) $r = n$ and $n < m$
 - (i) $\mathbf{b} \in Col(A) \leftrightarrow$ unique solution.
 - (ii) $\mathbf{b} \notin Col(A) \leftrightarrow$ no solution.
- (b) $r = m$ and $n > m$
- (c) $r < n$ and $r < m$
 - (i) $\mathbf{b} \in Col(A) \leftrightarrow$ Infinite solutions.
 - (ii) $\mathbf{b} \notin Col(A) \leftrightarrow$ no solution.
- (d) $r = n = m$