

List of Equivalences

Suppose that A is an n -by- n matrix. Then the following statements are all equivalent

1. A is non singular
2. $\text{Det}(A)$ is non zero
3. A is row equivalent to the identity matrix
4. $Ax=0$ has a unique solution, namely $x=0$
5. $Ax=b$ has a unique solution for every x in \mathbf{R}^n
6. A has rank n
7. A has nullity 0
8. The columns of A are linearly independent
9. The columns of A span \mathbf{R}^n
10. The columns of A form a basis
11. The rows of A are linearly independent
12. The rows of A span
13. The rows of A are a basis
14. The row space of A is \mathbf{R}^n
15. The column space of A is \mathbf{R}^n
16. The nullspace of A is $\{0\}$
17. The linear transformation L represented by A is one-to-one
18. The linear transformation L represented by A is onto
19. Zero is **not** an eigenvalue of A