

# Paper Note

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## Abstract

Row (column) operations are very important content when studying Linear Algebra. In this article, we show what properties the row operations change in a matrix. Note that the conclusion for the column operations is similar.

## Contents

Table 1: What properties do the row (column) operations change in a matrix? Some discussions are in [Link \(Row operations\)](#).

Properties	unchanged?	Reference
Column Space	✗	<a href="#">DeGroot and Schervish (2012, Sec. 4.3 Linear Independent Sets; Bases)</a> ; <a href="#">Link (column space)</a>
Linear Dependence Relation (Columns)	✓	<a href="#">Link (linear dependence relation among columns)</a>
Row Space	✓	<a href="#">DeGroot and Schervish (2012, Sec. 4.6 Rank)</a>
Linear Dependence Relation (Rows)	✗	<a href="#">DeGroot and Schervish (2012, Sec. 4.6 Rank)</a>
Null Space	✓	related to LDR among columns
Rank	✓	“Row Space is unchanged” and “ $\dim \text{Col } A = \dim \text{Row } A$ ” ( <a href="#">DeGroot and Schervish, 2012, Sec. 4.6 Rank</a> )
Determinant	✗	<a href="#">DeGroot and Schervish (2012, Sec. 3.2 Properties of Determinants)</a>

## References

Morris H DeGroot and Mark J Schervish. Probability and statistics. 2012.