

4.104(b)

1 4.104(b), §1 Asked

Asked: Find the rank of the matrix

$$\begin{pmatrix} 1 & 2 & -3 & -2 \\ 1 & 3 & -2 & 0 \\ 3 & 8 & -7 & -2 \\ 2 & 1 & -9 & -10 \end{pmatrix}$$

2 4.104(b), §2 Solution

$$\begin{pmatrix} 1 & 2 & -3 & -2 \\ 1 & 3 & -2 & 0 \\ 3 & 8 & -7 & -2 \\ 2 & 1 & -9 & -10 \end{pmatrix} \begin{matrix} (1) \\ (2) \\ (3) \\ (4) \end{matrix}$$

I expect the rank to be 4.

$$\begin{pmatrix} 1 & 2 & -3 & -2 \\ 0 & 1 & 1 & 2 \\ 0 & 2 & 2 & 4 \\ 0 & -3 & -3 & 6 \end{pmatrix} \begin{matrix} (1) \\ (2') = (2) - (1) \\ (3') = (3) - 3(1) \\ (4') = (4) - 2(1) \end{matrix}$$

I already see it is not.

$$\begin{pmatrix} \boxed{1} & 2 & -3 & -2 \\ 0 & \boxed{1} & 1 & 2 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix} \begin{matrix} (1) \\ (2') \\ (3'') = (3') - 2(2') \\ (4'') = (4') - 3(2') \end{matrix}$$

True rank is 2. There are only two independent row vectors in the matrix. There are only two independent column vectors in the matrix.