

Linear Algebra
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Exam 1
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1. Solve the following homogeneous system by any method.

$$\begin{aligned}x - 4y + z - w &= 0 \\x + 2y + 7z + 3w &= 0 \\x - 16y - 11z - 12w &= 0\end{aligned}$$

2. Prove the following identity without evaluating the determinants.

$$\begin{vmatrix} a_1+tc_1 & b_1 & c_1-rb_1 \\ a_2+tc_2 & b_2 & c_2-rb_2 \\ a_3+tc_3 & b_3 & c_3-rb_3 \end{vmatrix} = \begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix}$$

3. Consider the following set of vectors in \mathbb{R}^3 ,

$$\{(3,1,1), (2,-1,5), (4,0,-3)\}$$

- Are the vectors linearly dependent or independent?
- Do the vectors span \mathbb{R}^3 ?
- Do the vectors form a basis for \mathbb{R}^3 ?