

Math 54: Quiz #4

March 2

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Please give neat and organized answers. Whenever applicable (especially for computational questions), make it clear what strategy you are using.

Problem 1

Let

$$\mathbf{b}_1 = \begin{bmatrix} 7 \\ -2 \end{bmatrix}, \mathbf{b}_2 = \begin{bmatrix} 2 \\ -1 \end{bmatrix}, \mathbf{c}_1 = \begin{bmatrix} 4 \\ 1 \end{bmatrix}, \mathbf{c}_2 = \begin{bmatrix} 5 \\ 2 \end{bmatrix}.$$

Let $\mathcal{B} = \{\mathbf{b}_1, \mathbf{b}_2\}$ and $\mathcal{C} = \{\mathbf{c}_1, \mathbf{c}_2\}$. Check that \mathcal{B} and \mathcal{C} are bases for \mathbb{R}^2 . Then compute the change-of-coordinates matrix $P_{\mathcal{C} \leftarrow \mathcal{B}}$ from \mathcal{B} to \mathcal{C} .

Problem 2

Let $T : \mathbb{R}^4 \rightarrow \mathbb{R}^3$ be a linear transformation, and suppose that T is onto. What is $\dim(\ker(T))$?