MATH 54 SPRING 2019: DISCUSSION 109/112 QUIZ#3

GSI: CHRISTOPHER EUR, DATE: 2/26/2019

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Problem 1. Assume that the matrix A is row equivalent to B. What is $\operatorname{rank} A$ and $\dim \operatorname{Nul} A$?. Then find bases for $\operatorname{Col} A$, and $\operatorname{Nul} A$.

$$A = \begin{bmatrix} 1 & 1 & -3 & 7 & 9 & -9 \\ 1 & 2 & -4 & 10 & 13 & -12 \\ 1 & -1 & -1 & 1 & 1 & -3 \\ 1 & -3 & 1 & -5 & -7 & 3 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 1 & -3 & 7 & 9 & -9 \\ 0 & 1 & -1 & 3 & 4 & -3 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

Problem 2. Let V and W be vector spaces, and let $T : V \to W$ be a linear transformation. Given a subspace U of V, let $T(U)$ denote the set of all images of the form $T(x)$, where $x \in U$. Show that $T(U)$ is a subspace of W .