QUIZ 8 - MATH 305 Friday, November 3

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Read each problem **very carefully** before starting to solve it. Each problem is worth 5 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Let M_2 be the vector space of all 2×2 square matrices. Consider the transformation $T : M_2 \to M_2$, defined by $T(A) = A + A^T$, for all $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \in M_2$.

   (a) Show that T is a **linear** transformation.

   (b) Let $B \in M_2$ be such that $B^T = B$. Find an $A \in M_2$, such that $T(A) = B$.

   (c) Describe precisely the kernel of T.

2. Consider the matrix $A = \begin{bmatrix} 1 & 0 & -5 & 4 \\ -2 & 1 & 6 & -2 \\ 0 & 2 & -8 & 12 \end{bmatrix}$.

Hint: Parts (b) and (c) rely on Part (a).

(a) Reduced A to row reduced echelon form.

(a) Find a basis for $\mathsf{Nul}A$.

(c) Find a basis for $\mathsf{Col}A$.