Linear. Quiz 4. Name _____ Time _____

Consider the following subsets of $\mathbb{R}^3$

$$S = \left\{ \begin{bmatrix} 0 \\ -y \\ 3y \end{bmatrix} \middle| y \in \mathbb{R} \right\}, \quad T = \left\{ \begin{bmatrix} 0 \\ 2y \\ y+3 \end{bmatrix} \middle| y \in \mathbb{R} \right\}, \quad P = \left\{ \begin{bmatrix} 5x \\ x \\ y \end{bmatrix} \middle| x, y \in \mathbb{R} \right\}$$

(1) Which of the three is not a subspace? Show why not.

(2) For the other two that are subspaces, describe them as Spans, as in $V = Span\{\mathbf{a}, \mathbf{b}, \dots\}$.

$$A = \begin{bmatrix} 0 & 0 & 1 & 3 \\ 0 & 4 & 2 & 2 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 3 & -3 \end{bmatrix}, \quad B = \begin{bmatrix} 0 & 0 & 3 & 0 \\ 0 & 0 & 4 & 3 \\ 1 & 2 & 0 & 0 \\ 0 & 1 & 1 & 0 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 2 & 0 & 0 & 1 \end{bmatrix}$$

(3) Find the null spaces $N(A), N(B), N(C)$. See quiz 2 for reference.

(4) Find the column spaces $\mathrm{col}(A)$, $\mathrm{col}(B)$, and $\mathrm{col}(C)$ as spans of lin. indep. vectors.