

This is a two-stage quiz. You will receive this back with each question graded pass/fail in our next class meeting. You have until the date specified above to submit corrections for partial credit.

1. (3 points) Let  $W$  be the set of all vectors of the form  $\begin{bmatrix} s + 3t \\ s - t \\ 2s - t \\ 4t \end{bmatrix}$ . Show that  $W$  is a subspace of  $\mathbb{R}^4$  by finding a spanning set for  $W$ .

2. (3 points) If  $W$  is the set of all vectors of the form  $\begin{bmatrix} a - 2b \\ 3b + 4 \\ 5a \end{bmatrix}$ , is  $W$  a subspace of  $\mathbb{R}^3$ ? Justify why or why not.

3. (4 points) Consider the matrix

$$A = \begin{bmatrix} 1 & 0 & -4 & -3 \\ 0 & 1 & -2 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}.$$

(i) (2 points) Is  $\mathbf{u} = \begin{bmatrix} 3 \\ 1 \\ 0 \\ 1 \end{bmatrix}$  in  $\text{Nul}(A)$ ? Justify your answer.

(ii) (2 points) Give an explicit description of  $\text{Nul}(A)$  via a spanning set.