Last name _____

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LARSON—MATH 310–CLASSROOM WORKSHEET 05
Linear Combinations and Subspaces.

From Chp. 2 of Tsukada, et al., Linear Algebra with Python

Review: $\mathbb{R}$, *field, complex numbers*, $\mathbb{R}^2$, $\mathbb{K}$, $\mathbb{K}^n$, *linear space* (or *vector space*), *subspace, linear map* (or *linear transformation*), *kernel, range.*

From Chp. 3 of Tsukada, et al., Linear Algebra with Python

1. What is a *linear combination* of vectors?

2. What is an example?

3. (from pp. 48-49) Find the subspace of $\mathbb{R}^2$ generated by the vectors $\vec{p_1} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$ and $\vec{p_2} = \begin{bmatrix} 3 \\ 4 \end{bmatrix}$. Argue that the subspace *is* in fact $\mathbb{R}^2$.

4. (from p. 50) Find the subspace of $\mathbb{R}^3$ generated by the vector $\vec{p} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$.

5. (from p. 50) Find the subspace of $\mathbb{R}^3$ generated by the vectors $\vec{p} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ and $\vec{q} = \begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix}$.

6. Find the equation of the plane in $\mathbb{R}^3$ generated by the vectors $\vec{p} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ and $\vec{q} = \begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix}$.

7. What is the subspace *generated* by (or *spanned* by) a set of vectors?

8. What is an example?

9. Why is this collection a *subspace*?

10. What is a *finite-dimensional vector space*?