Last name _____

First name _____

LARSON—MATH 310–HOMEWORK WORKSHEET 02
First Concepts from Linear Algebra.

1. What are the real numbers $\mathbb{R}$?
2. What is a *field*?
3. What are the *complex numbers*?
4. Find the multiplicative inverse of $3 + 4i$? Explain.
5. Why are the complex numbers a field?
6. What is $\mathbb{R}^2$?
7. How can we interpret the *vectors* in $\mathbb{R}^2$ geometrically?
8. Explain addition in $\mathbb{R}^2$ geometrically. Consider $\vec{v} + \vec{w}$, where $\vec{v} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$ and $\vec{w} = \begin{bmatrix} 1 \\ 4 \end{bmatrix}$
9. Explain scalar multiplication in $\mathbb{R}^2$ geometrically. Consider $c\vec{v}$ where $c = 4$ and $\vec{v} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$.
10. What is $\mathbb{K}$?
11. What is a *linear space* (or *vector space*) over a field $\mathbb{K}$?
12. Argue that $\mathbb{R}^2$ is a vector space.
13. What is $\mathbb{K}^n$?
14. What is a *subspace* of a vector space? Give an example.
15. What is a *linear map* (or *linear transformation*) $f : V \to W$, from linear space V to linear space W?
16. Consider the linear map $f : \mathbb{R}^2 \to \mathbb{R}$ where $f(\begin{bmatrix} v_1 \\ v_2 \end{bmatrix}) = v_1$, for every $\vec{v} = \begin{bmatrix} v_1 \\ v_2 \end{bmatrix}$. Find the *kernel* of f.
17. Consider the linear map $f : \mathbb{R}^2 \to \mathbb{R}$ where $f(\begin{bmatrix} v_1 \\ v_2 \end{bmatrix}) = v_1$, for every $\vec{v} = \begin{bmatrix} v_1 \\ v_2 \end{bmatrix}$. Find the *range* of f.