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

1. Write up a **neat** assignment on a **new sheet** of paper. (Do not cram your answers between the lines). Typed using LaTeX would be even better.

2. **Number** your problems so that it is easy to see what work matches the assigned problems.

3. Be verbose. Remember that you do not understand a concept if you do not know an **examples**.

Problems

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.