Math 212 Common Errors in Homework # 2

1. Unnecessary notation is distracting. A common example of this is introducing variables such as A and $\vec{b}$ or $\vec{x}$ to label matrices and vectors when it is not needed.

2. If you are attempting to prove the equivalence of two expressions, do not start with the equality that you are trying to prove. Instead, begin with one side and write a chain of equalities that ends with the other side.

3. A matrix-vector product is written
$$\begin{bmatrix} a_1 & a_2 \\ a_3 & a_4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \end{bmatrix} \qquad \text{not} \qquad \begin{bmatrix} a_1 & a_2 \\ a_3 & a_4 \end{bmatrix} \times \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \end{bmatrix}.$$

4. Write complete sentences. Everything you write should be able to be read from top to bottom. Equations are sentences too, so make sure to use punctuation properly! Don't use symbols like $\therefore$ or $\rightarrow$ (which is not the same as $\implies$, and should not be used to direct a reader's attention) in a sentence mostly words.

5. Do not turn in rough drafts! Check your work and write your solutions neatly and clearly before turning them in. Make sure that every word or symbol you put on the paper is necessary.

6. The word 'assume' is not used in place of 'let' or 'write'. If you are proving something about an arbitrary vector $\vec{u} \in \mathbb{R}^n$, you may say,
$$\text{let } \vec{u} = \begin{bmatrix} u_1 \\ \vdots \\ u_n \end{bmatrix} \qquad \text{or} \qquad \text{write } \vec{u} = \begin{bmatrix} u_1 \\ \vdots \\ u_n \end{bmatrix}.$$

7. It is **not** generally true that for all $a, b \in \mathbb{R}$ and all $\vec{x}, \vec{y} \in \mathbb{R}^n$,
$$a\vec{x} + b\vec{y} = 0 \implies a = 0 \text{ and } b = 0.$$

8. It is possible that a linearly dependent set of vectors in $\mathbb{R}^n$ spans $\mathbb{R}^n$.

9. If it is possible to prove or explain something without using a contradiction technique, it is better to avoid doing so.

10. Quantify variables that you are using for your proofs in the proper place. For example, "for all $b \in \mathbb{R},\ 0 \neq b$" is not equivalent to "$0 \neq b$ for all $b \in \mathbb{R}$."

11. If a system has a free variable, this does not imply that the system has infinitely many solutions.

12. *Matrices* don't have solutions: *systems* do.

13. Do not confuse sets and matrices:
$$\begin{bmatrix} a & b & c \end{bmatrix} \neq \{a, b, c\}.$$

14. When writing the components of a *vector*, they themselves are not also vectors, they are scalars, so do not have vector arrows above them.
$$\begin{bmatrix} \vec{a} & \vec{b} & \vec{c} \end{bmatrix}$$
is a matrix whose columns are the vectors $\vec{a}$, $\vec{b}$, and $\vec{c}$, while
$$\begin{bmatrix} a & b & c \end{bmatrix}$$
is a matrix whose three entries are scalars.

15. Doing row reductions horizontally is better organizationally, and remember to put the row operations above the similar symbol between matrices like this: $\overset{R_1 \to R_1 + R_2}{\sim}$.