HOMEWORK ASSIGNMENT 2

Name: **Due:** Thursday January 31, 4PM

Problem 1:

Which of the following subsets of $\mathbb{F}$ (the vector space of functions from $\mathbb{R}$ to $\mathbb{R}$) are actually subspaces? Explain your answer.

(a) The set of functions f such that $f(0) = 1$.

(b) The set of functions f such that $f(0) = 0$.

(c) The set of functions f such that $f(-x) = -f(x)$ for all real numbers x (these are called **odd** functions.

(d) The set of functions f such that $f(-x) = f(x)$ for all real numbers x (these are called **even** functions.

(e) The set of functions f that are either even, odd, or both (this is called the **union** of the sets of even and odd functions).

Problem 2:

Build a matrix A such that the vectors $(1, 1, 1)$ and $(0, 1, 2)$ are in the column space and $(-1, 0, 3)$ is in the null space.

Problem 3:

Explain why these are all false:

1. The complete solution is any linear combination of $\mathbf{x_p}$ and $\mathbf{x_n}$.
2. A system $A\mathbf{x} = \mathbf{b}$ has at most one particular solution.
3. The solution $\mathbf{x_p}$ with all free variables zero is the shortest solution (minimum length $\|\mathbf{x}\|$). Find a 2 by 2 counterexample.
4. If A is invertible there is no solution $\mathbf{x_n}$ in the nullspace.

Problem 4:

Show that $\mathbf{v_1}$, $\mathbf{v_2}$, $\mathbf{v_3}$, $\mathbf{v_4}$ are dependent:

$$\mathbf{v_1} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \quad \mathbf{v_2} = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} \quad \mathbf{v_3} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \quad \mathbf{v_4} = \begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix}.$$

Solve $c_1\mathbf{v_1} + c_2\mathbf{v_2} + c_3\mathbf{v_3} + c_4\mathbf{v_4} = \mathbf{0}$ or $A\mathbf{x} = \mathbf{0}$. The $\mathbf{v}$'s go in the columns of A.

Problem 5: Challenge Problems from the zyBook

1.14.1, 3.3.1, 3.3.2, 3.4.1, 3.4.2, and 3.5.1. These are not optional.

Problem 6:

Read Chapter 3 from the zyBook and do all of the participation exercises therein. Which concept was more confusing for you?