Math 601 Homework #1. Due Wed., Jan. 24, 2018

Read Chapter 1 of the textbook (Bierbrauer)

Most of the exercises in the text are quick and easy, and you should try them all, to make sure you get the basics. I will assign some of the less routine exercises.

Write up and hand in solutions to the following exercises. You must give complete justification for all answers.

Exercises in textbook, Chapter 1

Sec. 1.1, p. 7, #1.1.4
Sec. 1.3, p. 12, #1.3.2
Sec. 1.4, p. 14, #1.4.2

Additional exercises (to hand in)

1. Prove: If u and v are in $\mathbf{F}^n$ and $u + v = \mathbf{0}$, then $u = v$.
2. Prove: For all u, v, w in $\mathbf{F}^n$, $d(u, w) \leq d(u, v) + d(v, w)$.
3. Find the minimum distance of the code $C = \{000000, 111110, 101101, 010111\}$.
4. Construct the IMLD table for the code $C = \{101, 011, 111\}$.
5. Find all the error patterns detected by the code $C = \{101, 011, 111\}$.
6. Prove: Let $C \subseteq \mathbf{F}^n$ be a code and suppose $\mathbf{0} \in C$. If the error pattern e is in C, then C does not detect e. (Hint: This is very short.)
7. Prove: Let $C \subseteq \mathbf{F}^n$ be a code. Then C does not detect the error pattern $e = \mathbf{0}$. (Hint: This is very short.)

Extra Credit:

1. p. 12, #1.3.3, with complete justification.
2. Prove: Let $x, y, z \in \mathbf{F}^n$, with $d(x, y) = d(y, z) = d(x, z) = 2$. Then there is a unique word $v \in \mathbf{F}^n$ such that $d(x, v) = d(y, v) = d(z, v) = 1$.