EXTRA CREDIT ASSIGNMENT

DUE ON OCTOBER 23 AT 5:00 PM

Instructions:

- This is an open-book assignment, but you must complete it by yourself, that is, without any assistance from other individuals.
- This assignment is worth up to 30 points, which will be added to your score on Exam 2.
- Write logically and succinctly. An answer presented in a disorganized manner makes it hard for me to understand what you really did, and consequently hard to grade it properly.

Problem 1. (*15 pts*) Let C be the linear code with parity-check matrix H given by

$$H = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 \end{bmatrix}.$$

Find the generator matrix in RREF for C. Show all working leading to your answer.

Problem 2. (*15 pts*) Let C be a linear code of length n and dimension k. Assume that C is a systematic code, that is, its generator matrix G is given by $G = [I_k \mid X]$, where I_k denotes the $k \times k$ identity matrix and X is a certain binary matrix. Prove that if $n - k \geq 2$, then the minimum distance of C is at most $n - k$.