

Problem set 3. Due Thursday, March 1
Mathematics 342, Term 2, 2018. Instructor: Reichstein.

- (1) Is 0131160938 a valid ISBN number?
- (2) Problem 4.4.
- (3) Problem 4.5.
- (4) Let C be the vector subspace of F_5^4 spanned by $(1, 1, 1, 1)$, $(1, 2, 0, 3)$ and $(4, 0, 3, 1)$. What is the dimension of C ? Construct a generator matrix and a parity check matrix for C .
- (5) Find a generator matrix and a parity check matrix for the ISBN code.
- (6) (a) For which prime numbers q is $G = \begin{pmatrix} 1 & 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 1 \end{pmatrix}$, a generator matrix for a q -ary linear code C in $V(6, q)$?
(b) If G is a generator matrix for C , determine whether or not the following words lie C : (101010) ? (112233) ?
- (7) Which of the following codes in F_q^n are linear? For each linear code find a generator matrix and a parity check matrix.
 - (a) $C_1 = \{(0000), (1111), (1010), (0101)\}$, $q = 2, n = 4$
 - (b) $C_2 = \{(0000), (1111), (1010), (0101)\}$, $q = 3, n = 4$
 - (c) $C_3 = \{000, 111, 222\}$, $q = 3, n = 3$
- (8) For each of the following subsets S of $GF(q)^n$, find a basis for, and the dimension of, the span of S . Also, determine if the given S is linearly independent.
 - (a) $S = \{1100, 1010, 1001, 0101\}$, $q = 2, n = 4$
 - (b) $S = \{1234, 3142, 2413, 4321\}$, $q = 5, n = 4$
 - (c) $S = \{0140, 4322, 1233, 2141\}$, $q = 5, n = 4$