

Math 641, Fall 1999

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Exercise Set 1, * exercises due September 17, 1999

1. Page 32: 2.5.7

2. Page 45-6: 3.8.3, 3.8.4, 3.8.5, 3.8.6, 3.8.7

* 3. Prove: (i) If C is an $[n, k, d]$ code, then every $n - d + 1$ columns of a generator matrix contain a set of k linearly independent columns (thus the information symbols can be regarded as k symbols from within the corresponding $n - d + 1$ coordinate positions).

(ii) d is the largest number with the above property.

* 4. Let C be the binary code with generator matrix

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$$

(i) Determine a parity check matrix for C .

(ii) Give (justification as needed) the parameters n, k, d, r, ρ .

(iii) Construct a *syndrome decoding table* and use it to decode 011011 and 000100.

* 5. Either construct or show non-existence of a $[12, 7, 5]$ binary code.