

CMSC 442 Fall 2003
Homework 3

- **READING ASSIGNMENT:** Peterson & Weldon, “**Error-Correcting Codes,**” MIT Press, (Second Edition), (1986), Chapter 2, Section 2.6
- **READING ASSIGNMENT:** Peterson & Weldon, “**Error-Correcting Codes,**” MIT Press, (Second Edition), (1986), Chapter 3.
- **OPTIONAL READING ASSIGNMENT:** MacWilliams & Sloane, “**The Theory of Error-Correcting Codes,**” North-Holland (Second Edition), (1983), Chapter 1.

1. Consider the following matrix over $GF(2)$

$$M = \begin{pmatrix} 0 & 1 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 \\ 1 & 1 & 0 & 0 & 1 \end{pmatrix}$$

- a) Prove that the rows of M are linearly dependent.
- b) Prove that the first three rows M form a basis for the row space of M .
- c) What is the dimension of the row space of M ? Explain your answer.

2. Consider the following matrix S over $GF(3)$

$$S = \begin{pmatrix} 0 & 0 & 2 & 2 & 0 & 2 \\ 2 & 2 & 0 & 2 & 1 & 2 \\ 1 & 1 & 2 & 0 & 2 & 2 \\ 1 & 1 & 0 & 1 & 2 & 1 \end{pmatrix}$$

- a) Put the matrix S into echelon canonical form. (**Hint.** See section 2.6 of text)
- b) Use the resulting echelon canonical form to find a basis for the row space of S . Explain your answer.
- c) What is the dimension of the row space of S ? Explain how you found your answer.