MAT 148, Winter 2016
Practice problems for midterm 1

1. Is the code with the following list of codewords linear? If it is, find the generator matrix G and the parity check matrix H in standard form.
a) $000, 100, 010, 001$
b) $0000, 11101, 01111, 10010$
c) $1111, 1000, 0100, 0010, 0001$
2. Find a linear code which corrects 2 errors with (a) two (b) four codewords.
3. Decode the message 111111 using the [7,4] Hamming code with the parity check matrix

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

4. A code has generator matrix

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

How many errors could it correct?
5. Is there a (a) [9,6] code correcting one error? (b) [9,4] code correcting two errors?
6. How many cosets does the code from problem 4 have? For each of them, compute the syndrome and find at least one vector in each coset.