Shannon Kuzmick **Homework 5** **Due 10-04-2013**

1. Encipher "$Cowboys''$ using hill with matrix: $\begin{pmatrix} 3 & 15 \\ 13 & 18 \end{pmatrix}$. Do the calculation (mod 26).

2. (Wait for Wednesday) Decipher "$Q!FEF,''$ using hill with matrix: $\begin{pmatrix} 10 & 9 \\ 3 & 20 \end{pmatrix}$. This calculation is done (mod 29). Note that the mod is different than the previous problem.

3. (Wait for Wednesday) Suppose you know the following message was enciphered with Hill (2 dimensions with mod 29):

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   P! IT WO BI XM PR
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   Break it knowing the first word of the message is "join".

4. Find all primes p for which $\begin{pmatrix} 3 & 5 \\ 7 & 3 \end{pmatrix} \pmod{p}$ is *not* invertible.

5. Find all values of the b with $0 \leq b < 25$ such that $\begin{pmatrix} 1 & 1 \\ b & 1 \end{pmatrix}$ is invertible (mod 26).

6. Look on the website for sporting events at USD. Choose an event in the future that you would be most likely to attend and write that down. I won't make you actually go to the event but consider doing it, it builds school spirit.