Megan Clarkson **Homework 3** **Due 09-20-2013**

1. Find q, r with $0 \leq r < a$, so that $b = a \cdot q + r$ with:
   (a) $a = 407941, b = 2249180$
   (b) $a = 541454, b = -3284539$.
   (c) $a = 159860, b = 4751$.

2. Compute the following:
   (a) 49077 % 7881
   (b) 233518891 % 697029

3. Without a calculator find the last digit of: $4409 \cdot 48411 + 9503 \cdot 14074 + 8114 \cdot 80518$.

4. (a) Without a calculator determine the remainder of 888205855434 when it is divided by 9.
   (b) Is 888205855434 divisible by 9?

5. Encipher the message "Broncos" using an affine cipher with key $a = 7$ and $b = 11$.

6. (Wait until Wednesday to try this problem.) Find the inverse of 13 (mod 29) (that is, find c such that $13c \equiv 1 \pmod{29}$).

   Do one of the following two problems, you can do both for extra credit.

7. Prove that if $a \equiv b \pmod{m}$ and c is an integer then $a + c \equiv b + c \pmod{m}$. You will use both the definition of mod and divisablitly.

8. Prove that if $d|a$ and $d|b$ then $d|a + b$ and $d|a - b$.

9. Find the following places on campus and take a picture of yourself there and send it to me.
   (a) The Math Learning Center
   (b) The Logic Center
   (c) The Writing Center