

Name:

**Modular Arithmetic By Hand:**

In this quiz, we will use properties of groups and CRT to do modular arithmetic by hand.

Compute each of the following by hand (no calculators). Show your work.

1.  $\gcd(123, 33)$

2.  $[10^{100005} \bmod 11]$

3.  $[23^{161} \bmod 55]$

4.  $[6^{1805} \bmod 35]$  (Hint: Use the CRT)

5. Let  $G = \mathbb{Z}_{11}^*$

(a) Compute the set  $\langle 2 \rangle$

(b) Compute the set  $\langle 4 \rangle$

(c) Compute  $4^{-1}$