Last name _____

First name _____

LARSON—MATH 353–HOMEWORK WORKSHEET 06

Suggestions: Write out lots of examples. Collect evidence. Doodle. You won't sit down knowing the right idea. But it **will** come if you start early, wrestle with the problem, read, sleep on it, and come back to it.

From Stein—Chapter 2

Algorithm 2.3.7 (Extended Euclidean Algorithm) Suppose a and b are integers and let $g = gcd(a, b)$. This algorithm finds g, x and y such that $ax + by = g$.

1. Apply the Extended Euclidean Algorithm to find $\gcd(12, 47)$ as a linear combination of 12 and 47.

2. Apply the Extended Euclidean Algorithm to find $\gcd(12, 51)$ as a linear combination of 12 and 51.

   Algorithm 2.3.8 (Inverse Modulo n). Suppose a and n are integers and $\gcd(a, n) = 1$. This algorithm finds an x such that $ax \equiv 1 \mod n$.

3. Apply this algorithm to find the multiplicative inverse of 12 mod 47.

4. How can you find the multiplicative inverse of 12 mod 47 with `Sage`/CoCalc? (What commands would you use?)

5. Find an integer of the form $n^2 + 1$, less than 1000, with the most divisors. How many divisors does it have?