



NUMBER THEORY
FALL 2020

ASSIGNMENT 5.1
DUE SEPTEMBER 30

Exercise 1. Textbook exercise 4.4.1(a)-(c).

Exercise 2. Let $m, n \in \mathbb{N}$. If $m|n$, prove that the reduction map

$$a + n\mathbb{Z} \mapsto a + m\mathbb{Z},$$

from $\mathbb{Z}/n\mathbb{Z}$ to $\mathbb{Z}/m\mathbb{Z}$, is a surjective ring homomorphism.

Exercise 3. Use the Euclidean Algorithm to compute the (multiplicative) inverse of $43 + n\mathbb{Z}$ for the following values of n .

- a. $n = 47$
- b. $n = 51$
- c. $n = 1000$

Exercise 4. Use the preceding exercise to solve the following linear congruences.

- a. $43x \equiv 9 \pmod{47}$
- b. $43x \equiv 3 \pmod{51}$
- c. $43x \equiv 500 \pmod{1000}$