

MATH 243 – Mathematical Structures

Problem Set 4

Due: October 6, 2017

I. Let m, b be integers and consider the mapping $f : \mathbb{Z} \rightarrow \mathbb{Z}$ defined by $f(x) = mx + b$.

(A) Prove that f is injective if and only if $m \neq 0$.

(B) Find conditions on m, b equivalent to saying f is surjective and prove your assertion.

II. Let b, c be integers and define $f : \mathbb{Z} \rightarrow \mathbb{Z}$ by $f(x) = x^2 + bx + c$.

(A) Show that f is *not injective*.

(B) Show that f is *not surjective*.

III. For each of the following pairs of integers N, n , find the integer quotient q and remainder $0 \leq r < n - 1$ satisfying $N = qn + r$ as in Theorem 4.8.

(A) $N = 796, n = 26$

(B) $N = 1205, n = 37$

(C) $N = -27, n = 7$.

From the Text: Exercises 4.4, 4.5, 4.6, 4.8.