Math 220/970(HNR)-Homework 5

Due Wednesday 10/14 at the beginning of class

PART A

Problems from the textbook:

Section 3.1 # 3(a,b,d,f), 8(b), 10, 15, 17, 18(a,b), 19, 21, 22

PART B

1. Let $f : \mathbf{R} \to \mathbf{R}$ be defined by $f(x) = 5x + 2015$.

   (a) Prove that $Im f = \mathbb{R}$.

   (b) Compute $f([-7, 3])$. *(Give a formal proof.)*

2. Let $f \in F(\mathbf{R})$ be defined by $f(x) = -x^2$ and $S = \{y \in \mathbf{R} \mid y \leq 0\}$. Prove that $Im f = S$.

3. For each of the following functions write out $f(X)$ and $f^{-1}(W)$ for the given sets X and W, where $f : \mathbb{Z} \to \mathbb{Z}$. (**No proofs are necessary.**)

   (a)
   $$f(n) = \begin{cases} n + 1 & \text{if} \quad n \in \mathbb{E} \\ n & \text{if} \quad n \in \mathbb{O} \end{cases}, \quad X = \{0, 1, 5, 9\}, \quad W = \mathbb{O}.$$

   (b) $f(n) = n^2$, $X = \{-2, -1, 0, 1, 2\}$, $W = \{2, 7, 11\}$