

Homework Assignment 3

Math 243, Spring 2012

1. Consider the following subsets, A, B of \mathbb{R} , where $A = [0, 10]$ and $B = (5, 15]$.

A. Find $\chi_A \cdot \chi_B$

B. Find $\chi_A + \chi_B - \chi_{A \cap B}$

C. Find $\chi_A + \chi_B - 2 \cdot \chi_{A \cap B}$

2. Let $f : \mathbb{N} \rightarrow \mathbb{N}$ be the function $f(n) = \max\{n, 4\}$.

(A) Determine if f is one-to-one.

(B) Determine if f maps \mathbb{N} onto \mathbb{N} .

(C) Is f a one-to-one correspondence between \mathbb{N} and \mathbb{N} ?

(D) Find $f^{\leftarrow}(2)$.

(E) Does $f^{-1}(2)$ exist? If it exists, find it, if not explain why.

3. Let $f : \mathbb{N} \rightarrow \mathbb{N}$ be the function $f(n) = n + 1$. Let $g : \mathbb{N} \rightarrow \{0, 1\}$ be the characteristic function, $g(n) = \chi_A(n)$, where $A = \{1, 2, 3, 4, 5\}$.

(A) Find $h(n) = (g \circ f)(n)$.

(B) Determine if h is one-to-one.

(C) Determine if h maps \mathbb{N} onto $\{0, 1\}$.

(C) Is h a one-to-one correspondence between \mathbb{N} and $\{0, 1\}$?

(D) Find $h^{\leftarrow}(1)$.