

ITCS 2175 HW 5

1) [3 points each]

Determine whether each of the following functions from the set $\{a,b,c,d\}$ to itself is one-to-one.

- $f(a)=b, f(b)=a, f(c)=c, f(d)=d$
- $f(a)=b, f(b)=b, f(c)=d, f(d)=c$
- $f(a)=d, f(b)=b, f(c)=c, f(d)=d$

2) [2.5 points each]

Determine whether each of the following functions from \mathbf{Z} to \mathbf{Z} is one-to-one.

- $f(n) = n - 1$
- $f(n) = n^2 + 1$
- $f(n) = n^3$
- $f(n) = \lceil n/2 \rceil$

3) [5 points each]

Find $f \circ g$ and $g \circ f$ where $f(x) = x^2 + 1$ and $g(x) = x + 2$ are functions from \mathbf{R} to \mathbf{R} .

4) [10 points each]

Let f be a function from the set A to the set B . Let S and T be subsets of A . Show that:

a) $f(S \cup T) = f(S) \cup f(T)$

b) $f(S \cap T) \subseteq f(S) \cap f(T)$

5) [10 points each]

Let f be a function from A to B . Let S and T be subsets of B . Show that:

a) $f^{-1}(S \cup T) = f^{-1}(S) \cup f^{-1}(T)$

b) $f^{-1}(S \cap T) = f^{-1}(S) \cap f^{-1}(T)$