CIS 185
Practice 8

Name:
ID:
Date:

Objective:

- Be able to determine whether a function is bijective, surjective or injective.
- Be able to find inverse function and compositional function

Exercise 1: Give an example of a function from **N** to **N** that is

a) one-to-one but not onto.

$f(x) = x^2$

b) onto but not one-to-one.

$f(x) = \frac{x}{2}$

c) both onto and one-to-one (but different from the identity function).

$f(x) = \begin{cases} 2n-1 & \text{if } x \text{ is odd} \\ 2n+1 & \text{if } x \text{ is even} \end{cases}$

d) neither one-to-one nor onto.

$f(x) = 0$

Exercise 2:

Sets A and X are defined as:

A = { a, b, c, d }

X = { 1, 2, 3, 4 }

A function f: A → X is defined to be

f = { (a, 3), (b, 1), (c, 4), (d, 1) }

a. What is the target (or co-domain) of function f?

$f(x)$

b. What is the range of function f?

[1,4]

c. What is f(c)?

4

d. What is the domain of function f?

[a, d]

Exercise 3: Consider three functions f, g, and h, whose domain and target are **Z**. Let

$$f(x)=x^2 \qquad g(x)=2^x \qquad h(x)=\lceil x^5 \rceil$$

a. Evaluate g o h o f(4)

$g(h(f(4))) = 2^{1048576}$

b. Give a mathematical expression for f o g.

$f(g(x)) = (2^x)^2$

Exercise 4: For each of the following functions, indicate whether the function has a well-defined inverse. If the inverse is well-defined, give the input/output relationship of f^{-1}.

a. f: Z → Z. f(x) = 2x + 3

The function is not onto, so f^{-1} is not well defined

b. f: R → R. f(x) = 2x + 3

$f^{-1}(x) = \frac{(x-3)}{2}$

$(x-3) = 2y$