Handout 2.3

- **Definition**: Let A and B be nonempty sets. A *function* f from A to B, denoted f: $A \to B$ is an assignment of each element of A to exactly one element of B. We write f(a) = b if b is the unique element of B assigned by the function f to the element a of A.
- Given a function f: $A \to B$:
- We say *f maps A* to *B or* f is a mapping from A to B.
- A is called the *domain* of f.
- B is called the *codomain* of f.
- If $f(a) = b$,
-
  - then b is called the *image* of a under f.
  - a is called the *pre-image* of b.
- The range of f is the set of all images of points in **A** under f. We denote it by $f(A)$.
- Two functions are *equal* when they have the same domain, the same codomain and map each element of the domain to the same element of the codomain.
- **Definition**: A function f is said to be *one-to-one* , or *injective*, if and only if $f(a) = f(b)$ implies that $a = b$ for all a and b in the domain of f. A function is said to be an *injection* if it is one-to-one.
- **Definition**: A function f from A to B is called *onto* or *surjective*, if and only if for every element b in B, there is an element a in A with f(a)=b. A function f is called a *surjection* if it is onto.
- **Definition**: A function f is a *one-to-one correspondence*, or a *bijection*, if it is both one-to-one and onto (surjective and injective).

f^{-1} •**Definition**: Let f be a bijection from $f^{-1}(y) = x$ iff $f(x) = y$ A to B.Then the *inverse* of f, denoted , is the $f \circ g$ function from B to A defined as

$f \circ g(x) = f(g(x))$

- **Definition**: Let f: $B \to C$, g: $f(x) = \lfloor x \rfloor$ $A \to B$. The *composition of f with g*, denoted is the function from A to C defined by

$f(x) = \lceil x \rceil$

- The *floor* function, denoted is the largest integer less than or equal to x.
- The *ceiling* function, denoted is the smallest integer greater than or equal to x.