
UTM
UNIVERSITI TEKNOLOGI MALAYSIA
INSPIRING CREATIVE AND INNOVATIVE MINDS
www.utm.my
Chapter 2
(Part 2)
Functions

Exercise 1

Determine which of the relations *f* are functions from the set *X* to the set *Y*.

a) $X = \{ -2, -1, 0, 1, 2 \}$, $Y = \{ -3, 4, 5 \}$ and
$f = \{ (-2,-3), (-1,-3), (0,4), (1,5), (2,-3) \}$

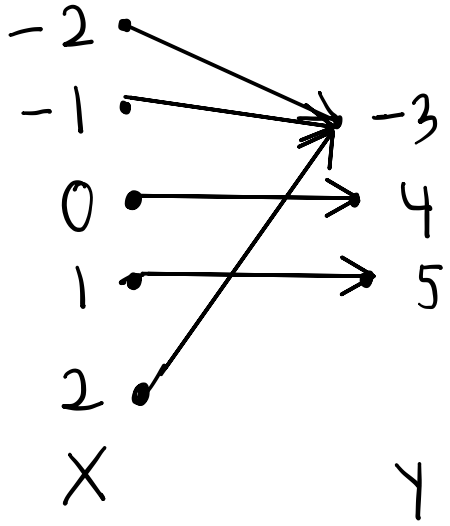
b) $X = \{ -2, -1, 0, 1, 2 \}$, $Y = \{ -3, 4, 5 \}$ and
$f = \{ (-2,-3), (1,4), (2,5) \}$

c) $X = Y = \{ -3, -1, 0, 2 \}$ and
$f = \{ (-3,-1), (-3,0), (-1,2), (0,2), (2,-1) \}$

In case any of these relations are functions, determine if they are one-to-one, onto *Y*, and/or bijection.

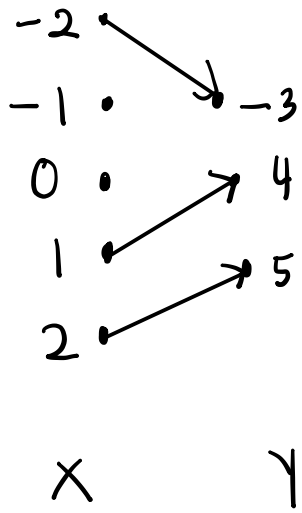
Determine which of the relations f are functions from the set X to the set Y.

a) $X = \{ -2, -1, 0, 1, 2 \}$, $Y = \{ -3, 4, 5 \}$ and
$f = \{ (-2,-3), (-1,-3), (0,4), (1,5), (2,-3) \}$



This is function. This function is not one-to-one because $f(-2)=f(-1)=f(2)=-3$.
It is onto Y.
Since the function is onto Y but not one-to-one,
∴ It is not bijection

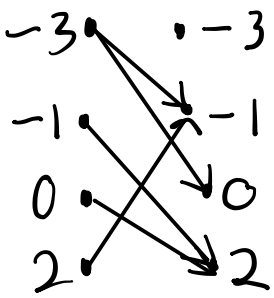
b) $X = \{ -2, -1, 0, 1, 2 \}$, $Y = \{ -3, 4, 5 \}$ and
$f = \{ (-2,-3), (1,4), (2,5)\}$



This is not function.
This is because -1 and 0 dont have image.

c) $X = Y = \{ -3, -1, 0, 2 \}$ and

$f = \{ (-3,-1), (-3,0), (-1,2), (0,2), (2,-1) \}$



This is function.

The function is not one-to-one because $f(-3) = f(2) = -1$

The function is not onto Y because -3 dont have object.

Therefore this is not bijection because the function is not one-to-one and onto Y.

Exercise 2

- Find each inverse function.

a) $f(x) = 4x + 2, \quad x \in R$

b) $f(x) = 3 + (1/x), \quad x \in R$

- Find each inverse function.

a) $f(x) = 4x + 2,\ x \in R$

$f(x) = y$

let $f^{-1}(y) = x$

$y = 4x + 2$

$y - 2 = 4x$

$x = \frac{y-2}{4}$

$f^{-1}(y) = \frac{y-2}{4}$

$f^{-1}(x) = \frac{x-2}{4}$

b) $f(x) = 3 + (1/x),\ x \in R$

$f(x) = y$

let $f^{-1}(y) = x$

$y = 3 + \frac{1}{x}$

$y - 3 = \frac{1}{x}$

$x = \frac{1}{y-3}$

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

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

Exercise 3

- Let f dan g be functions from the positive integers to the positive integers defined by the equations,

  $f(n) = n^2$, $g(n) = 2^n$

- Find the compositions

  a) $f \circ f$

  b) $g \circ g$

  c) $f \circ g$

  d) $g \circ f$

- Let f dan g be functions from the positive integers to the positive integers defined by the equations,

  $f(n) = n^2$, $g(n) = 2^n$

a) $f \circ f$

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

$= (n^2)^2$

$= n^4$

b) $g \circ g$

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

$= 2^{(2^n)}$

$= (2^2)^n$

$= 4^n$

c) $f \circ g$

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

$= (2^n)^2$

$= 4^n$

d) $g \circ f$

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

$= 2^{n^2}$