IQ ACADEMY

Exercise set (2.3)

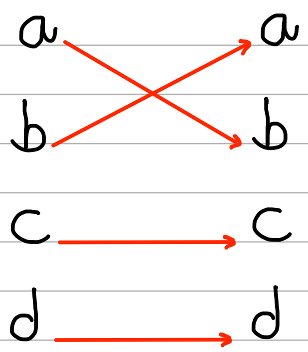
10. Determine whether each of these functions from $\{a, b, c, d\}$ to itself is one-to-one.

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

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

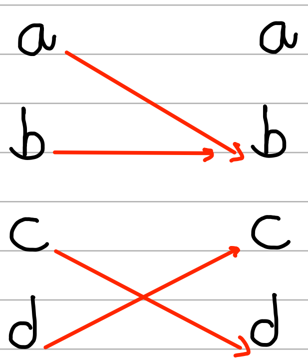
c) $f(a) = d, f(b) = b, f(c) = c, f(d) = d$

a)



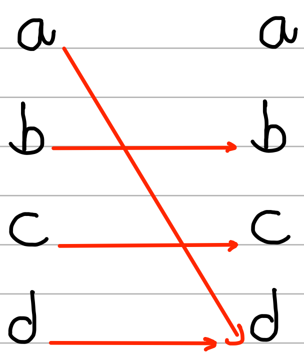
one to one

b)



Not one to one

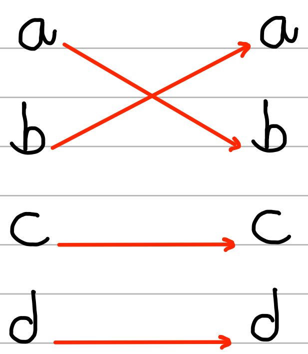
C)



Not one to one

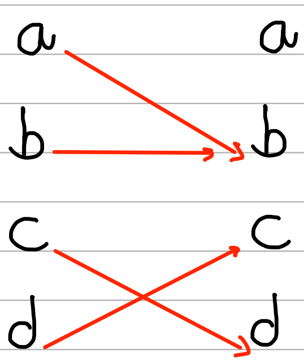
11. Which functions in Exercise 10 are onto?

a)



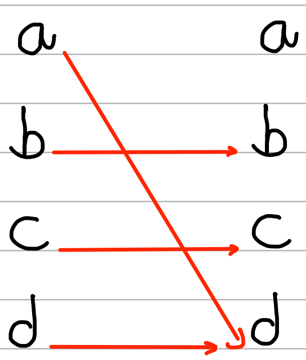
onto

b)



not onto

c)



not onto

12. Determine whether each of these functions from **Z** to **Z** is one-to-one.

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

a) $f(n) = n - 1$

one to one and onto

b) $f(n) = n^2 + 1$

not one to one and not onto

c) $f(n) = n^3$

one to one

d) $f(n) = n/2$

not one to one

13. Which functions in Exercise 12 are onto?

a) $f(n) = n - 1$

onto

b) $f(n) = n^2 + 1$

not onto

c) $f(n) = n^3$

not onto

d) $f(n) = n/2$

onto

16. Consider these functions from the set of students in a discrete mathematics class. Under what conditions is the function one-to-one if it assigns to a student his or her

a) mobile phone number.

b) student identification number.

c) final grade in the class.

d) home town.

a) one to one if no student share the phone number

b) one to one if no student share the identification number

c) one to one if every student receives a different final grade

d) one to one if every student comes from a different home town

17. Consider these functions from the set of teachers in a school. Under what conditions is the function one-to-one if it assigns to a teacher his or her

a) office.

b) assigned bus to chaperone in a group of buses taking students on a field trip.

c) salary.

d) social security number.

a) one to one if and only if no two teachers share the same office

b) one to one if and only if no two teachers are assigned to the same bus

c) one to one if no two teachers earn same salary

d) one to one Provided each teachers has unique social security number

IQ ACADEMY

22. Determine whether each of these functions is a bijection from **R** to **R**.

a) $f(x) = -3x + 4$
b) $f(x) = -3x^2 + 7$
c) $f(x) = (x + 1)/(x + 2)$
d) $f(x) = x^5 + 1$

a) $f(X) = -3X + 4$

- its linear function and slope $-3 \neq 0$ (one to one)

- its onto because every number in the Codomain have at least one Preimage in the domain

So its bijection

b) $f(X) = -3X^2 + 7$

$f(2) = -3(2)^2 + 7 = 19$

$f(-2) = -3(2)^2 + 7 = 19$

So $f(2) = f(-2)$ So its not one to one

not bijection

c) $f(x) = \dfrac{x+1}{x+2}$

The domain is all real number except $x = -2$

$y = \dfrac{x+1}{x+2} \rightarrow y(x+2) = x+1$

$\rightarrow yx + 2y = x + 1$

$yx - x = 1 - 2y$

$x(y-1) = 1 - 2y$

$x = 1 - 2y / y - 1$

So the Range y exclude $y = 1$ (it is not onto)

not bijection

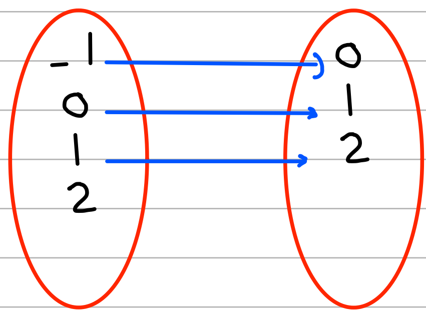
d) $f(x) = x^5 + 1$

$f(-1) = (-1)^5 + 1 = -1 + 1 = 0$

$f(1) = (1)^5 + 1 = 1 + 1 = 2$

$f(a) = f(b)$ if $a = b$ $\longrightarrow$ one to one

Range: $(-\infty, +\infty)$



So the range = Codomain

then its onto

So its bijection

23. Determine whether each of these functions is a bijection from **R** to **R**.

a) $f(x) = 2x + 1$
b) $f(x) = x^2 + 1$
c) $f(x) = x^3$
d) $f(x) = (x^2 + 1)/(x^2 + 2)$

a) $f(x) = 2x + 1$

- its linear function and slope $2 \neq 0$ (one to one)
- its onto because every number in the Codomain have at least one Preimage in the domain

So its bijection

b) $f(x) = x^2 + 1$

$f(1) = (1^2) + 1 = 2$

$f(-1) = (-1^2) + 1 = 2$

So $f(1) = f(-1)$ So its not one to one

its not bijection

c) $f(x) = x^3$

$f(-1) = (-1)^3 = -1$

$f(1) = (1)^3 = 1$

$f(a) = f(b)$ if $a = b \longrightarrow$ one to one

its bijection

d) $f(x) = \dfrac{x^2 + 1}{x^2 + 2}$

$f(-1) = \dfrac{(-1)^2 + 1}{(-1)^2 + 2} = \dfrac{2}{3}$

$f(1) = \dfrac{1^2 + 1}{1^2 + 2} = \dfrac{2}{3}$

$f(-1) = f(1)$ So its not one to one

its not bijection