Question 7 is perhaps the simplest question in the list, you may want to start with it as warm-up.

Exercises

1 Determine if the relations below is a) single-valued ~~constant~~, b) constant valued. c) one to one relation, d) one to one correspondence each of Justify your answers.

i $R_1 = \{(x, y) : x = 0\}$

ii $R_2 = \{(x, y) : y = 0\}$

iii $R_3 = \{(x, y) : x + 1 = 2\}$

iv $R_4 = \{(x, y) : y = |x|\}$

v $R_5 = \{(x, y) : y = \sin x\}$

vi $R_6 = \{(x, y) : y = x^2\}$.

$R_7 = \{(x, \sqrt{x})\} \subseteq \mathbb{R}^{\geq 0} \times \mathbb{R}^{\geq 0}$

~~$R_8 = \{$~~

2 For which values of ~~x~~ m & c is the relation $R = \{(x, y) : mx + c = y,\ m, c \in \mathbb{R}\}$ a constant relation on the cartesian plane $\mathbb{R} \times \mathbb{R}$.

3 When is a constant relation a

i 1–1 relation?

ii 1–1 correspondence?

4 Let $A = \{1, 2\}$, $B = \{a, b\}$. Find relations R_1 and R_2 ($R_1 \neq R_2$) that are 1–1 correspondence in $A \times B$.

5 Let A & B be finite sets such that $|A| > |B|$. Which & $R \subseteq A \times B$ of following is impossible?

i R is single-valued ii) R^{-1} is single-valued

iii) R is constant valued iv) R^{-1} is constant valued

v R is 1–1 relation vi) R^{-1} is 1–1 relation

vii There is a 1–1 correspondence in $A \times B$.

6 Let Mr Ojo be the father of Bola, Yemi & Tade, Mr Hassan the father of ~~Ahmed and~~ Mariam, while Mr Emeka is the father of Ngozi, Chuks, Kosi & Ada. Suppose we define sets A & B as follows:

$A = \{$Ojo, Hassan, Emeka$\}$ $B = \{$Bola, Yemi, Tade, ~~Ahmed~~, Mariam, Ngozi, Kosi, Chuks, Ada$\}$

Suppose we define $R \subseteq A \times B$ as

$R = \{(a,b) : a \text{ is father of } b\}$.

a) Is R single-valued.

b) Is R^{-1} single-valued, where $R^{-1} = \{(b,a) : b \text{ is son of } a\}$

c) What can be done to set A or B to make ~~R~~

i) R ii) R^{-1} single-valued.

7 Let $A = \{1,2,3\}$, $B = \{a,b\}$. a) Which of the following is single-valued. Justify your answer

i $R_1 = \{(1,a), (2,a), (3,b)\}$

ii $R_2 = \{(1,a), (2,a), (3,a)\}$

iii $R_3 = \{(1,a), (2,b)\}$

b Construct a constant value rltn in $A \times B$.

c) What are the inverses of R_1, R_2 & R_3.