Section 2.1: cont'd

Tuesday, October 20, 2015
10:30 AM

example: let $x \in \{1, 2, 3\}$ and $y \in \{2, 4, 6\}$.

$(x, y) \in A$ iff $x \leq y$. Find A.

x	y
1	2
1	4
1	6
2	2
2	4
2	6
3	4
3	6

function:

function $\equiv$ a relation which for each value of the x-component, has only one value of the y-component.

examples: function?

x	y
-1	1
0	0
1	1

✓

x	y
1	-1
0	0
1	1

✗

instructor	course
Pat	Math 163
Pat	Math 172
Lean	Math 172

✗

Cartesian product:

example: let $A = \{0, 1, 2\}$
and $B = \{3, 4\}$

then $A \times B = \{(0,3), (0,4), (1,3), (1,4), (2,3), (2,4)\}$

$B \times A = \{(3,0), (3,1), (3,2), (4,0), (4,1), (4,2)\}$

$B \times B = \{(3,3), (3,4), (4,3), (4,4)\}$

definition: the Cartesian product $A \times B$ is the set of all ordered pairs where the first coordinate (x-coordinate) belongs set A and the second coordinate (y) belongs to B.

or $\equiv$ $A \times B = \{(x,y) \mid x \in A \text{ and } y \in B\}$

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example:

let $X = \{0,1,2\}$, $Y = \{3\}$, and $Z = \{0,3\}$.

find
a) $Y \times Z$
b) $Y \times Z \times Y$
c) $Y \times Y$
d) $Y \times X$
e) $Y \times Y \times Y \times Y$

a) $Y \times Z = \{(3,0), (3,3)\}$

b) $Y \times Z \times Y = \{(3,0,3), (3,3,3)\}$

c) $Y \times Y = \{(3,3)\}$

d) $Y \times X = \{(3,0), (3,1), (3,2)\}$

e) $Y \times Y \times Y \times Y = \{(3, 3, 3, 3)\}$

True or False, for the same sets as above:

f) $X \times Y$ is a function. Yes (T)

no repeated x-values

g) $Y \times X$ is a function. No (F)

h) $\underset{\substack{\uparrow \\ \text{set} \\ \text{of numbers}}}{Y} \subseteq \underbrace{Y \times Z}_{\text{set of ordered pairs}}$ No (F)

$3 \neq (3, 3)$

i) $Y \times Y \subseteq Z \times Y$ Yes (T)

$Y \times Y$

x	y
3	3

$Z \times Y$

x	y
0	3
3	3

if $A = \{a, b\}$, $B = \{0, 1, 2\}$, and $C = \{$, $\}$,

then how many elements would be in $B \times B \times A \times C \times A \times A$?

$= 3 \times 3 \times 2 \times 2 \times 2 \times 2$

$= 144$