MATH 151

Relations Part 1

Lecture 4

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Exercise 1: Let R be the relations from $A=\{0,1,2,3,4\}$ to $B=\{1,2,3,4,5\}$ defined as follows $a\,R\,b \Leftrightarrow a>b$

i. List all order pairs of R
ii. Represent the relation R by matrix

Exercise 2: Let R be the relations from $A=\{1,2,3,4\}$ defined as follows

$x\ R\ y \Leftrightarrow x^2+y^2\le 13$

i. List all order pairs of R
ii. Represent the relation R by matrix

Exercise 3: Let R be the relations from $A = \{0,1,2,3,4,5,6,7\}$ defined as follows

$$x \; R \; y \Leftrightarrow 2x - y = 4$$

i. List all order pairs of R
ii. Find the domain and range (image) of R
iii. Represent the relation R by digraph

Exercise 4: Let R be the relations from $A = \{-2,-1,0,1,2,3,4\}$ defined as follows

$$a\,R\,b \Leftrightarrow a^2 = b$$

i. List all order pairs of R
ii. Find the domain and range (image) of R
iii. Represent the relation R by digraph

Exercise 5: Let R be the relations from $A=\{-2,-1,0,1,2\}$ to $B=\{2,3,4,5\}$ defined as follows

$$a\,R\,b \Leftrightarrow b=a^2+1$$

i. List all order pairs of R
ii. Find the domain and range (image) of R
iii. Represent the relation R by matrix

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Exercise 6: Let $R = \{(x, y) ; |x - y| \leq 1\}$ and $S = \{(x, y) ; 2x + y \leq 6\}$ be two relations defined on a set $A = \{1, 2, 3, 4\}$

i. List the elements of R and S

ii. Find M_R , M_S and $M_{R \circ S}$

Exercise 7: Let $S = \{(x,z),(y,x),(y,y),(z,y)\}$ be a relation on $C = \{x,y,z\}$

i. Find $S^{-1} o S$

ii. Find S^2

Exercise 8: Let $S=\{(1,1),(1,2),(3,1),(3,3)\}$ be a relation on $C=\{1,2,3\}$. find:

i. S^{-1}

ii. $S \cap S^{-1}$

iii. $S - S^{-1}$

iv. S^{2}

Exercise 9: Let $S=\{(u,v),(v,x),(x,y),(y,u)\}$ be a relation on $C=\{u,v,x,y\}$. find:

i. M_s

ii. S^{2}

iii. $S\,O\,S^{-1}$

Exercise 10: Let $S=\{(1,1),(1,3),(2,2),(2,3),(3,2)\}$ be a relation on $C=\{1,2,3\}$. find:

i. M_s

ii. $S \cap S^{-1}$

iii. $\bar{S} \cap S^{-1}$

iv. S^2

Exercise 11: Let $S=\{(a,b),(a,c),(b,a)(c,a)\}$ be a relation on $C=\{a,b,c\}$. find:

i. S^2

ii. S^3

Exercise 12: Let $S=\{(a,c),(a,d),(b,b)(c,a),(c,d)\}$ and $T=\{(a,b),(b,a),(b,b),(b,d),(d,a),(d,c)\}$ be a relation on $C=\{a,b,c,d\}$. find:

i. $S-T^{-1}$

ii. T^{2}

iii. $S\oplus T$ remark $(S\oplus T=(S\cup T)-(S\cap T))$

Exercise 13: Let $S=\{(a,d),(b,a),(b,b)(b,d),(d,a),(d,d)\}$ be a relation on $C=\{a,b,c,d\}$. find:

i. $S^{-1}\,o\,S$

ii. $S\,o\,S^{-1}$