

MATH 300

Properties of Relations

PROPERTY	DEFINITION	SET FORMULATION	MATRIX TEST	DIGRAPH TEST
Reflexive	$\forall x: xRx$	$\Delta \subseteq R$	All elements on the principle diagonal are 1.	Loop at each vertex.
Symmetric	$\forall x,y: xRy \Rightarrow yRx$	$R = R^{-1}$	The matrix is symmetric.	Edges occur only in oppositely directed pairs.
Transitive	$\forall x,y,z: xRy \wedge yRz \Rightarrow xRz$	$R^n \subseteq R$	$M = M \vee M^{[2]} \vee \dots \vee M^{[n]}$	If there is a path from vertex a to vertex b, then there is an edge from a to b.
Antisymmetric	$\forall x,y: xRy \wedge yRx \Rightarrow x = y$	$R \cap R^{-1} \subseteq \Delta$	$i \neq j \Rightarrow m_{ij} = 0 \vee m_{ji} = 0$	There is no oppositely directed pair of edges.

In the table R is a relation on set A, $R: A \rightarrow A$. The cardinality of A is n.