

Q3: List the ordered pairs in the relations on {1, 2, 3} corresponding to these matrices (where the rows and columns correspond to the integers listed in increasing order).

- A) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$

- B) $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 0 \end{bmatrix}$

Q5: How can the matrix representing a relation R on a set A be used to determine whether the relation is irreflexive?

Q7: Determine whether the relations represented by the matrices below are reflexive, irreflexive, symmetric, antisymmetric, and/or transitive.

- A) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$

- B) $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 0 \end{bmatrix}$

Reflexive relation:

A relation R is called reflexive relation if $(x,x) \in R$ for every $x \in A$.

Irreflexive relation:

A relation R is called irreflexive relation if $(x,x) \notin R$ for every $x \in A$.

Symmetric relation:

A relation R is called symmetric relation if $(y,x) \in R$, whenever $(x,y) \in R$, for all $x, y \in A$.

Anti-symmetric relation:

A relation R is anti-symmetric if for all $x, y \in A$, $(x,y) \in R$ and $(y,x) \in R$, then $x = y$.

Transitive relation:

A relation R is called transitive relation, whenever $(x,y) \in R$ and $(y,z) \in R$, then $(x,z) \in R$ for all $x, y, z \in A$.

Q9: How many nonzero entries does the matrix representing the relation R on $A = \{1, 2, 3, \dots, 100\}$ consisting of the first 100 positive integers have if R is

- A) $\{(a,b) \mid a > b\}$
- B) $\{(a,b) \mid a \neq b\}$
- C) $\{(a,b) \mid a = b + 1\}$
- D) $\{(a,b) \mid ab = 1\}$

Q11: How can the matrix for \bar{R} (the complement of the relation R) be found from the matrix representing R, when R is a relation on a finite set A

Q12: How can the matrix for R^{-1} (the inverse of the relation R) be found from the matrix representing R, when R is a relation on a finite set A

Q13: Let R be the relation represented by the matrix $M_R = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$,

Find the matrix representing: a) R^{-1} , b) \bar{R} , c) R^2

Q19: Draw the directed graphs representing each of the relations:

a) $\{(1, 2), (1, 3), (1, 4), (2, 3), (2, 4), (3, 4)\}$

b) $\{(1,1),(1,4),(2,2),(3,3),(4,1)\}$

c) $\{(1,2),(1,3),(1,4),(2,1),(2,3),(2,4),(3,1),(3,2), (3, 4), (4, 1), (4, 2), (4, 3)\}$

Q23: List the ordered pairs in the relations represented by the directed graph:

