Answer on Question#37634 - Math - Discrette Mathematics

Find the transitive closure of R = {(a, a), (b, a), (b, c), (c, a), (c, c), (c, d), (d, a), (d,c)} on the set {a, b, c, d}.

Solution:

The relation is represented by a matrix:
R:

	a	b	c	d
a	1	0	0	0
b	1	0	1	0
c	1	0	1	1
d	1	0	1	0

The first composition is:

R

	a	b	c	d
a	1	0	0	0
b	1	0	1	0
c	1	0	1	1
d	1	0	1	0

∘

R

	a	b	c	d
a	1	0	0	0
b	1	0	1	0
c	1	0	1	1
d	1	0	1	0

=

R ∘ R

	a	b	c	d
a	1	0	0	0
b	1	0	1	1
c	1	0	1	1
d	1	0	1	1

The union $R \cup R \circ R$ is:

	a	b	c	d
a	1	0	0	0
b	1	0	1	0
c	1	0	1	1
d	1	0	1	1

There are no new links added, so we can stop the process.
The transitive closure is equal to the original relation, hence the original relation R is transitive.