Practical 2c

Finding whether or not, a given relation is:
i.Reflexive
ii. Antisymmetric
iii. Transitive
iv. Partial order

1

A relation R on a set A is called transitive if

whenever (a, b) ∈ R and (b, c) ∈ R,

then (a, c) ∈ R, for all a, b, c ∈ A.

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(%i1) kill(all);
(%o0) done
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ex 7 : Rosen

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(%i1) A:makelist(k, k, 1, 4);
(%o1) [1,2,3,4]

(%i2) R1:[[1, 1], [1, 2], [2, 1], [2, 2], [3, 4], [4, 1], [4, 4]];
(%o2) [[1,1],[1,2],[2,1],[2,2],[3,4],[4,1],[4,4]]

(%i3) R2:[[1, 1], [1, 2], [2, 1]];
(%o3) [[1,1],[1,2],[2,1]]

(%i4) R3: [[1, 1], [1, 2], [1, 4], [2, 1], [2, 2], [3, 3], [4, 1], [4, 4]];
(%o4) [[1,1],[1,2],[1,4],[2,1],[2,2],[3,3],[4,1],[4,4]]

(%i5) R4:[[2, 1], [3, 1], [3, 2], [4, 1], [4, 2], [4, 3]];
(%o5) [[2,1],[3,1],[3,2],[4,1],[4,2],[4,3]]

(%i6) R5:[[1, 1], [1, 2], [1, 3], [1, 4], [2, 2], [2, 3], [2, 4], [3, 3], [3, 4], [4, 4]];
(%o6) [[1,1],[1,2],[1,3],[1,4],[2,2],[2,3],[2,4],[3,3],[
3,4],[4,4]]

(%i7) R6:[[3, 4]];
(%o7) [[3,4]]
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(%i8)  R7:[[1,  1],  [3, 4]];
(%o8)  [[1,1],[3,4]]

(%i9)  R8:cartesian_product_list(A,   A);
(%o9)  [[1,1],[1,2],[1,3],[1,4],[2,1],[2,2],[2,3],[2,4],[
       3,1],[3,2],[3,3],[3,4],[4,1],[4,2],[4,3],[4,4]]

       if(s=length(R)) then return("symmetric") else return("Not symmetric")

(%i10) checkTransitive(A,  R):=block(
         [s:0,  t],
         for i:1 thru length(A) do(
             for j:1 thru length(A) do(
                 for k:1 thru length(A) do(
                     if(member([A[i],  A[j]],  R) and member([A[j],  A[k]],   R))
                 then(if(member([A[i],  A[k]],   R )) then(s:0) else(s:1, return(s)))
                 ),
                 if(s=1) then(return(s))
             ),
             if(s=1) then(return(s))
          ),
          if(s=1) then(return("not transitive")) else(return("transitive"))
        );
(%o10) checkTransitive(A,R):=block([s:0,t],for i thru
       length(A) do (for j thru length(A) do (for k thru length(A)
       do if member([A_i,A_j],R) ∧ member([A_j,A_k],R) then if
       member([A_i,A_k],R) then s:0 else (s:1,return(s)) ,if s=1
       then return(s) ),if s=1 then return(s) ),if s=1 then
       return(not transitive) else return(transitive))

(%i11) checkTransitive(A,   R1);
(%o11) not transitive

(%i12) checkTransitive(A,   R2);
(%o12) not transitive

(%i13) checkTransitive(A,   R3);
(%o13) not transitive

(%i14) checkTransitive(A,   R4);
(%o14) transitive

(%i15) checkTransitive(A,   R5);
(%o15) transitive
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(%i16) checkTransitive(A,   R6);
(%o16) transitive

(%i17) checkTransitive(A,   R7);
(%o17) transitive

(%i18) checkTransitive(A,   R8);
(%o18) transitive
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