① Checking reflexivity:

Let $A=\{1,2,3\}$ and $R=\{(1,1),(2,2),(3,3)\}$

Step 1- Verify that every element in A is related to itself:

- $(1,1)\in R$ ✓
- $(2,2)\in R$ ✓
- $(3,3)\in R$ ✓

Answer: R is reflexive on A

② Checking Symmetry and Anti-Symmetry:

Let $A=\{a,b\}$ and $R=\{(a,b),(b,a)\}$

Step 1- Check Symmetry:

- $(a,b)\in R$ and $(b,a)\in R \rightarrow$ Symmetric ✓

Step 2- Check anti-Symmetry:

- Since $(a,b)\in R$ and $(b,a)\in R$ but $a\neq b$, anti-Symmetry is violated X

Answer: The relation is symmetric but not anti-symmetric

③ Checking Transivity:

Let $A=\{1,2,3\}$ and $R=\{(1,2),(2,3),(1,3)\}$

- Verify that if $(1,2)\in R$ and $(2,3)\in R$, then $(1,3)\in R$ ✓

Answer: The relation R is transistive

④ A relation with mixed properties:

Let $A=\{x,y,z\}$ and $R=\{(x,x),(y,y),(z,z),(x,y),(y,x),(y,z)\}$

Reflexivity:

- Each element x,y,z is related to itself ✓

Symmetry:

- $(x,y)\in R$ and $(y,x)\in R \rightarrow$ Symmetric for x and y
- However $(y,z)\in R$ but $(z,y)\notin R \rightarrow$ Not Symmetric overall X

Anti-Symmetry:

- (x,y) and (y,x) are both present and $x\neq y$ so anti-symmetry is violated. X

Transitivity:

- Check: $(x,y)\in R$ and $(y,z)\in R$ require $(x,z)\in R$, which is missing X

Answer: The relation R is reflexive, but neither symmetric, anti-symmetric, nor transistive