Show that the relation R in R defined as $R = \{(a,b) : a \leq b\}$ is reflexive and transitive, but not symmetric.

Solution:

$R = \{(a,b) : a \leq b\}$

$(a,a) \in R$

$\therefore$ R is reflexive.

$(2,4) \in R$ (as $2 < 4$)

$(4,2) \notin R$ (as $4>2$)

$\therefore$ R is not symmetric.

$(a,b),(b,c) \in R$

$a \leq b$ and $b \leq c$

$\Rightarrow a \leq c$

$\Rightarrow (a,c) \in R$

$\therefore$ R is transitive.

R is reflexive and transitive but not symmetric.