1. ⇒ Suppose the relation on set is symmetric. That means .

⊆ Let . Since is symmetric, as well. Which means . Therefore .

⊇ Let . By the definition of the inverse of a relation, . Since is symmetric, as well. Therefore .

Therefore .

⇐ On the other hand, suppose . Let . That implies . By the definition of the inverse of a relation, we know that since then . Therefore is symmetric.