

## Step-1

Suppose  $T$  is a reflection across the  $45^\circ$  line and  $S$  is a reflection across the  $y$ -axis.

And the domain  $\mathbf{V}$  is the  $x$ - $y$  plane.

Let  $v = (1, 2)$

Then  $T(v) = (1, 2)$

Now we have to find  $S(T(v))$  and  $T(S(v))$ .

## Step-2

Now

$$S(T(v)) = S(1, 2)$$

$$= (-1, 2) \quad (\text{because } S \text{ is reflection across } y\text{-axis})$$

$$T(S(v)) = T(S(2, 1))$$

$$= T(-2, 1) \quad (\text{because } S \text{ is reflection across } y\text{-axis})$$

$$= (1, -2) \quad (\text{since } T \text{ is reflection across } 45^\circ \text{ line})$$

Therefore  $\boxed{ST \neq TS}$