

Composition of Transformations

Reflections

$$\begin{aligned}r_{x\text{-axis}}(x, y) &\longrightarrow (x, -y) \\r_{y\text{-axis}}(x, y) &\longrightarrow (-x, y) \\r_{y=x}(x, y) &\longrightarrow (y, x) \\r_{y=-x}(x, y) &\longrightarrow (-y, -x) \\r_{\text{origin}}(x, y) &\longrightarrow ((-x, -y))\end{aligned}$$

Rotations

$$\begin{aligned}R_{(0,0) 90^\circ}(x, y) &\longrightarrow (-y, x) \\R_{(0,0) 180^\circ}(x, y) &\longrightarrow (-x, -y) \\R_{(0,0) 270^\circ}(x, y) &\longrightarrow (y, -x)\end{aligned}$$

Translations

$$T_{(a,b)}(x, y) \longrightarrow (x + a, y + b)$$

Remember to work compositions from **RIGHT to LEFT**. (\longleftarrow)

Perform the following compositions by formula, then by graphing.

- $T_{(4,1)} \circ r_{y\text{-axis}}(5, 1)$
- $R_{y\text{-axis}} \circ T_{(4,1)}(2, 3)$
- Based on those two problems, are the transformation commutative?
- $T_{(3,-1)} \circ R_{\text{origin } 90^\circ}(6, 1)$
- $R_{(0,0) 90^\circ} \circ r_{y=x}(4, 3)$
- $T_{(3,-1)} \circ T_{(4,3)}(5, -2)$
- $r_{x\text{-axis}} \circ r_{y=x}(4, -3)$
- $T_{(3,-1)}(r_{y\text{-axis}}(5, 1))$
- Compare #8 to #1.
- Define a reflection in a line k of a point P .
- Define a rotation in a point O through α°