**Additional Exercise:** Let $L_1$ be the $x$-axis in $\mathbb{R}^2$, and let $L_2$ be the line given by the equation $y = x$. Let $R_i$ be the reflection at the line $L_i$ for $i = 1, 2$.

(a) Show that $R_1(x, y) = (x, -y)$ and $R_2(x, y) = (y, x)$. It suffices to draw representative pictures for a point $(x, y)$.

(b) Calculate $R_2R_1(x, y) = R_1(R_2(x, y))$ and $R_1R_2(x, y) = R_1(R_2(x, y))$.

(c) According to what we did in class $R_1R_2$ and $R_2R_1$ are rotations. Determine the angle. *(Hint: Calculate the dot product between $(x, y)$ and $R_1R_2(x, y)$).*

(d) Calculate the orders of $R_1$, $R_2$, $R_1R_2$ and $R_2R_1$. Here the order of the operation $T$ on $\mathbb{R}^2$ is the smallest power $n$ such that $T^n$ is the identity map.