Remember that the important part of all these problems is the explanation of your answer, not your answer itself. You will not receive anywhere near full credit for a correct answer unless you explain why your answer is correct.

1. On the graph paper provided, carefully draw the figure that the given “R” is sent to when $\mathbb{R}^2$ is reflected across the $x$ axis. Do the same for a reflection across the $y$ axis. (Be sure to label which is which.)

2. On the graph paper provided, carefully draw the figure that the given “R” is sent to when $\mathbb{R}^2$ is rotated about the origin by 90° counterclockwise. Do the same for a rotation about the point $(1, 2)$ by 45° clockwise. (Again be sure to label which is which.)

3. Let $T_1, T_2 : \mathbb{R}^2 \to \mathbb{R}^2$ be translations by arbitrary directed line segments $\vec{s}_1, \vec{s}_2$ in $\mathbb{R}^2$.
   
   (a) What function is $T_2T_1$? (You should be able to express this as a single familiar function, rather than the composition of two functions.)
   
   (b) What function is $T_1T_2$? (You should be able to express this as a single familiar function, rather than the composition of two functions.)

4. Let $F_1, F_2 : \mathbb{R}^2 \to \mathbb{R}^2$ be reflections across arbitrary lines $L_1, L_2$ in $\mathbb{R}^2$.
   
   (a) What function is $F_2F_1$? (You should be able to express this as a single familiar function, rather than the composition of two functions.)
   
   (b) What function is $F_1F_2$? (You should be able to express this as a single familiar function, rather than the composition of two functions.)

5. Let $F : \mathbb{R}^2 \to \mathbb{R}^2$ be the reflection across an arbitrary line $L$ in $\mathbb{R}^2$, and let $T : \mathbb{R}^2 \to \mathbb{R}^2$ be translation by an arbitrary directed line segment $\vec{s}$ in $\mathbb{R}^2$.
   
   (a) What function is $TF$? (You should be able to express this as a single familiar function, rather than the composition of two functions.)
   
   (b) What function is $FT$? (You should be able to express this as a single familiar function, rather than the composition of two functions.)