11. Write down the $2 \times 2$ matrix, $M_1$, associated with a reflection in the $y$-axis.

Write down a second $2 \times 2$ matrix, $M_2$, associated with an anticlockwise rotation through an angle of $\frac{\pi}{2}$ radians about the origin.

Find the $2 \times 2$ matrix, $M_3$, associated with an anticlockwise rotation through $\frac{\pi}{2}$ radians about the origin followed by a reflection in the $y$-axis.

What single transformation is associated with $M_3$?

**Answers**

$M_1 = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$

$M_2 = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$

$M_3 = M_1M_2 = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

Reflection in the line $y = x$