Combining Matrix Transformations

Find the matrices that represent the following transformations:
(a) A reflection in the x-axis, followed by a rotation through $180°$ centre the origin.
(b) An enlargement with centre the origin and scale factor 2, followed by a reflection in the line $y = x$.
(c) A reflection in the y-axis followed by a reflection in the line $y = x$.
(d) A reflection in the line $y = x$ followed by enlargement about the origin with scale factor 3.

(a) $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$

(b) $\begin{pmatrix} 0 & 2 \\ 2 & 0 \end{pmatrix}$

(c) $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

(d) $\begin{pmatrix} 0 & 3 \\ 3 & 0 \end{pmatrix}$

Point $(3, -2)$ is transformed by the matrix $\begin{pmatrix} 1 & -1 \\ 0 & 1 \end{pmatrix}$ followed by a further transformation by the matrix $\begin{pmatrix} 0 & 2 \\ 1 & 0 \end{pmatrix}$.
(i) Work out the matrix for the combined transformation.
(ii) Work out the co-ordinates of the image point of P.

(i) $\begin{pmatrix} 0 & 2 \\ 1 & -1 \end{pmatrix}$

(ii) $(-4, 5)$

Point $(-1,4)$ is transformed by the matrix $\begin{pmatrix} 3 & -1 \\ -2 & 2 \end{pmatrix}$ followed by a further transformation by the matrix $\begin{pmatrix} 1 & 0 \\ 3 & -2 \end{pmatrix}$.
(i) Work out the matrix for the combined transformation.
(ii) Work out the co-ordinates of the image point of W.

(i) $\begin{pmatrix} 0 & 2 \\ 4 & -4 \end{pmatrix}$

(ii) $(8, -20)$

The transformation matrix $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ maps a point P to Q. The transformation matrix $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ maps point Q to point R. Point R is $(-4,3)$. Work out the coordinates of point P.

$a = 3$
$b = 4$