i

$x_1 \times x_1 : (1,2) \times (1,2) = 1 \times 1 + 2 \times 2 = 5$
$x_1 \times x_2 : (1,2) \times (-2,1) = 1 \times -2 + 2 \times 1 = 0$
$x_1 \times x_3 : (1,2) \times (-1,-2) = 1 \times -1 + 2 \times -2 = -5$
$x_1 \times x_4 : (1,2) \times (2,-1) = 1 \times 2 + 2 \times -1 = 0$

$x_2 \times x_1 : (-2,1) \times (1,2) = -2 \times 1 + 1 \times 2 = 0$
$x_2 \times x_2 : (-2,1) \times (-2,1) = -2 \times -2 + 1 \times 1 = 5$
$x_2 \times x_3 : (-2,1) \times (-1,-2) = -2 \times -1 + 1 \times -2 = 0$
$x_2 \times x_4 : (-2,1) \times (2,-1) = -2 \times 2 + 1 \times -1 = -5$

$x_3 \times x_1 : (-1,-2) \times (1,2) = -1 \times 1 + -2 \times 2 = -5$
$x_3 \times x_2 : (-1,-2) \times (-2,1) = -1 \times -2 + -2 \times 1 = 0$
$x_3 \times x_3 : (-1,-2) \times (-1,-2) = -1 \times -1 + -2 \times -2 = 5$
$x_3 \times x_4 : (-1,-2) \times (2,-1) = -1 \times 2 + -2 \times -1 = 0$

$x_4 \times x_1 : (2,-1) \times (1,2) = 2 \times 1 + -1 \times 2 = 0$
$x_4 \times x_2 : (2,-1) \times (-2,1) = 2 \times -2 + -1 \times 1 = -5$
$x_4 \times x_3 : (2,-1) \times (-1,-2) = 2 \times -1 + -1 \times -2 = 0$
$x_4 \times x_4 : (2,-1) \times (2,-1) = 2 \times 2 + -1 \times -1 = 5$

$$\Longrightarrow \quad \begin{bmatrix} 5 & 0 & -5 & 0 \\ 0 & 5 & 0 & -5 \\ -5 & 0 & 5 & 0 \\ 0 & -5 & 0 & 5 \end{bmatrix}$$

ii — anotherthing anotherthing