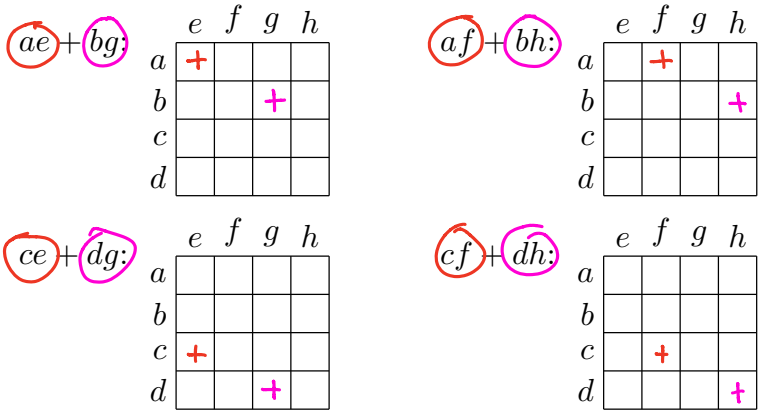
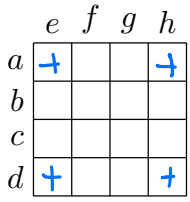
⇒ Fill in the + and − symbols in these charts for the 4 *target* expressions in the matrix product—these are the ones we need for our final answer:



⇒ Now fill in the symbols for the three key products figured out by Strassen, namely m_1, m_2, and m_3:

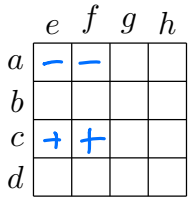
$m_1 = (a+d)(e+h)$:

$ae + ah + de + dh$



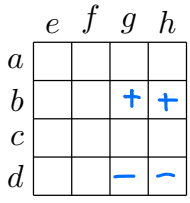
$m_2 = (c-a)(e+f)$:

$ce + cf - ae - af$

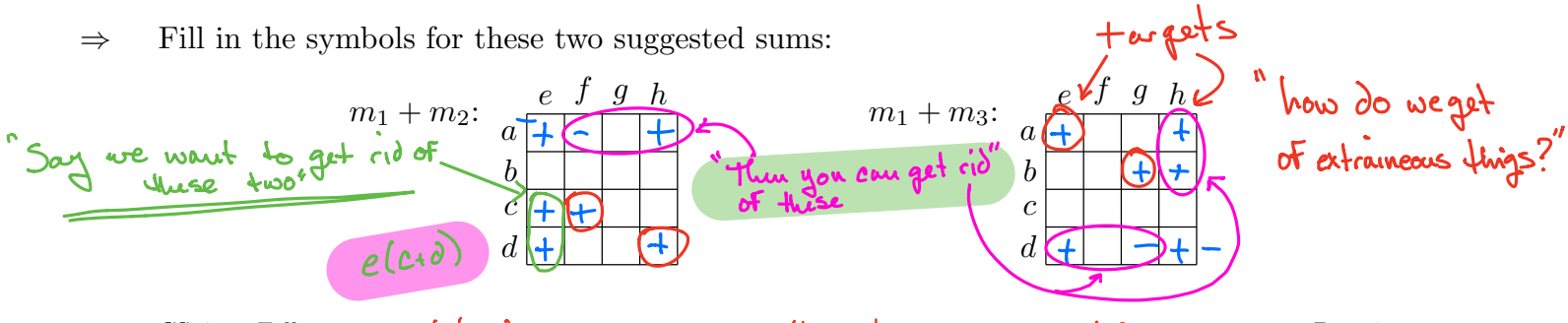


$m_3 = (b-d)(g+h)$:

$bg + bh - dg - dh$



⇒ Fill in the symbols for these two suggested sums:



(hint: do $m_4 \cdots m_7$ to get patterns to add or subtract from $m_1 + m_3$, $m_1 + m_2$ to get diagonal targets
Then, turns out, can combine some of these 7 charts to get off-diagonal targets)

Exercise 9

$$\begin{bmatrix} 5 & 7 \\ 4 & 2 \end{bmatrix} \cdot \begin{bmatrix} 9 & 1 \\ 3 & 6 \end{bmatrix}$$

$$m_1 = (5+2)(9+6) = 7 \cdot 15 = 105$$

$$m_2 = (4+2) \cdot 9 = 54$$

$$m_3 = 5 \cdot (1-6) = -25$$

$$m_4 = 2(3-9) = -12$$

$$m_5 = (5+7)6 = 72$$

$$m_6 = (4-5)(9+1) = -10$$

$$m_7 = (7-2)(3+6) = 45$$

$$= \begin{array}{|c|c|} \hline c_{11} = m_1 + m_4 - m_5 + m_7 & c_{12} = m_3 + m_5 \\ \hline c_{21} = m_2 + m_4 & c_{22} = m_1 - m_2 + m_3 + m_5 \\ \hline \end{array}$$

$$= \begin{array}{|c|c|} \hline 66 & 47 \\ \hline 42 & 16 \\ \hline \end{array}$$