

$$\boxed{(ABC)' + 2(C'B)} = \begin{pmatrix} 1 \\ 2 & 4 \\ 1 & 2 \end{pmatrix} \cdot \begin{pmatrix} -2 & 4 \\ 1 & -2 \end{pmatrix} = \begin{pmatrix} (1)(-2) + (4)(1) & (2)(-2) + (4)(-2) \\ (1)(-2) + (2)(1) & (1)(4) + (2)(-2) \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$$

$$a) (AB)(C) = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix} \begin{pmatrix} 1 & -1 & 2 \\ -1 & 3 & -1 \end{pmatrix} = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \Rightarrow \boxed{(ABC)' = \begin{pmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix}}$$

$$(C'B) = \begin{pmatrix} 1 & -1 \\ -1 & 3 \\ 2 & -1 \end{pmatrix} \cdot \begin{pmatrix} -2 & 4 \\ 1 & -2 \end{pmatrix} = \begin{pmatrix} (1)(-2) + (-1)(1) & (1)(4) + (-1)(-2) \\ (-1)(-2) + (3)(1) & (-1)(4) + (3)(-2) \\ (2)(-2) + (-1)(1) & (2)(4) + (-1)(-2) \end{pmatrix} =$$

$$= \begin{pmatrix} -3 & 6 \\ 5 & -10 \\ -5 & 10 \end{pmatrix}$$

$$2 \cdot C'B = \begin{pmatrix} -6 & 12 \\ 10 & -20 \\ -10 & 20 \end{pmatrix}$$

$$(ABC)' + 2(C'B) = \begin{pmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix} + \begin{pmatrix} -6 & 12 \\ 10 & -20 \\ -10 & 20 \end{pmatrix} =$$

$$= \boxed{\begin{pmatrix} -6 & 12 \\ 10 & -20 \\ -10 & 20 \end{pmatrix}}$$

$$b) (CC') = \begin{pmatrix} 1 & -1 & 2 \\ -1 & 3 & -1 \\ 2 & -1 \end{pmatrix} \cdot \begin{pmatrix} 1 & -1 \\ -1 & 3 \\ 2 & -1 \end{pmatrix} = \begin{pmatrix} (1)(1) + (-1)(-1) + (2)(2) & (1)(-1) + (-1)(3) + (2)(-1) \\ (-1)(1) + (3)(-1) + (-1)(2) & (-1)(-1) + (3)(3) + (-1)(-1) \\ (2)(1) + (-1)(-1) & (2)(-1) + (-1)(3) + (-1)(-1) \end{pmatrix}$$

$$= \begin{pmatrix} 6 & -6 \\ -6 & 11 \\ -6 & 11 \end{pmatrix}$$

$$(CC') \cdot (CC') = \begin{pmatrix} 6 & -6 \\ -6 & 11 \\ -6 & 11 \end{pmatrix} \begin{pmatrix} 6 & -6 \\ -6 & 11 \\ -6 & 11 \end{pmatrix} = \begin{pmatrix} (6)(6) + (-6)(-6) & (6)(-6) + (-6)(11) \\ (-6)(6) + (11)(-6) & (-6)(-6) + (11)(11) \\ (-6)(6) + (11)(-6) & (-6)(-6) + (11)(11) \end{pmatrix}$$

$$= \begin{pmatrix} 36 + 36 = 72 & -36 - 66 = -102 \\ -36 - 66 = -102 & 36 + 121 = 157 \end{pmatrix} = \boxed{\begin{pmatrix} 72 & -102 \\ -102 & 157 \end{pmatrix}}$$