

$$1) \begin{pmatrix} 3 & -1 & 4 \\ 2 & 3 & 1 \end{pmatrix} * \begin{pmatrix} 1 & 4 & 3 \\ -2 & 2 & -1 \\ 1 & 2 & 5 \end{pmatrix} * \begin{pmatrix} 3 & 2 & 4 & 3 \\ 1 & 0 & 2 & -1 \\ -1 & 1 & -1 & 3 \end{pmatrix}$$

$$2) -2i^3 \begin{pmatrix} 3i+1 & 3i & 6i-1 \\ 2-i & 5 & 2i+1 \\ 4+2i & -2i & 5-2i \end{pmatrix} \begin{pmatrix} 2i & 5i \\ 3 & 6 \\ -4i & 2i \end{pmatrix}$$

$$3) \begin{pmatrix} 2 & -1 & 3 & 1 \\ 4 & -2 & -1 & 4 \\ 2 & 5 & 1 & 0 \end{pmatrix} * \begin{pmatrix} 3 & 2 \\ 1 & -1 \\ 2 & 0 \\ 5 & 1 \end{pmatrix} + \frac{1}{2} \begin{pmatrix} 14 & -4 & 6 \\ 6 & 8 & 2 \end{pmatrix}^T$$

$$1) \begin{pmatrix} 15 & 48 & 42 & 99 \\ -1 & 2 & 12 & -1 \end{pmatrix} \quad \textcircled{*} \begin{pmatrix} -30+36j & -42-54i \\ 50i & -24+62i \\ 36-24i & -36-12i \end{pmatrix}$$

$$2) \left. \begin{array}{l} -2i^3 = -2 \cdot (-i) = 2i \\ -2i^3 \cdot i = -2i^4 = -2 \end{array} \right\} \begin{array}{l} (3i+1)(-2i^3) \\ -6+2i \end{array}$$

$$\begin{pmatrix} -6+7i & -6 & -12-7i \\ 4i+2 & 10i & -4+7i \\ 8i-4 & +4 & 10i+4 \end{pmatrix} \begin{pmatrix} 2i & 5i \\ 3 & 6 \\ -4i & 2i \end{pmatrix}$$

$$\left(\begin{array}{cc} -12i-4-18+48i-8 & -30i-10+36-24i+4 \\ -8+4i+30i+16i+8 & -20+10i+60i-8i-4 \\ -16-8i+12+40-16i & -40-20i+24-20+8i \end{array} \right) \textcircled{*}$$

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$$i^3 = -i \quad i^3 \cdot 5 = -5i$$

$$i^3 \cdot i = i^4 = 1$$

$$i^3 \begin{pmatrix} -1-2i & -3i+1 & 3i+2 \\ 3+i & 2i+3 & i+3 \\ i+4 & 2i+5 & 4i-3 \end{pmatrix} \cdot \begin{pmatrix} 2i \\ -3i \\ 2 \end{pmatrix}$$

$$\begin{pmatrix} i+2 & -3-i & 3-2i \\ -3i+1 & 2-3i & 1-3i \\ 1-4i & 2-5i & 4+3i \end{pmatrix} \cdot \begin{pmatrix} 2i \\ -3i \\ 2 \end{pmatrix}$$

$$\begin{pmatrix} \underline{-2} - \underline{4i} + \underline{9i} - \underline{3} & \underline{+6} - \underline{4i} \\ 6 + 2i & -6i - 9 \\ 2i + 8 & +6i - 15 \end{pmatrix} = \begin{pmatrix} 1+i \\ -1-10i \\ 1+2i \end{pmatrix}$$