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$$A + B = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 6 \\ 6 & 1 & 4 \\ 4 & 3 & 1 \end{bmatrix} + \begin{bmatrix} 2 & 1 & 4 & 5 \\ 3 & 5 & 1 & 3 \\ 6 & 3 & 2 & 1 \\ 1 & 4 & 6 & 4 \end{bmatrix} = \begin{bmatrix} 3 & 6 & 6 & 8 \\ 6 & 7 & 7 & 8 \\ 12 & 4 & 6 & 2 \\ 5 & 7 & 7 & 6 \end{bmatrix}$$

$$A - B = \begin{bmatrix} -4 & -2 & -2 \\ 0 & -3 & 5 & 2 \\ 0 & -2 & 2 & 0 \\ 3 & -1 & -5 & -2 \end{bmatrix}$$

$$(1 \times 2) + (5 \times 3) + (2 \times 6) + (3 \times 1) = 2 + 15 + 12 + 3 = \underline{\underline{32}}$$

$$(1 \times 1) + (5 \times 5) + (2 \times 3) + (3 \times 4) = 1 + 25 + 6 + 12 = \underline{\underline{44}}$$

$$A \times B = \begin{aligned} (1 \times 4) + (5 \times 1) + (2 \times 2) + (3 \times 6) &= 4 + 5 + 4 + 18 = \underline{\underline{31}} \\ (1 \times 5) + (5 \times 3) + (2 \times 1) + (3 \times 4) &= 5 + 15 + 2 + 12 = \underline{\underline{31}} \end{aligned}$$

$$(3 \times 2) + (2 \times 3) + (6 \times 6) + (5 \times 1) = 6 + 6 + 36 + 5 = \underline{\underline{53}}$$

$$(3 \times 1) + (2 \times 5) + (6 \times 3) + (5 \times 4) - 3 + 10 + 18 + 20 = \underline{\underline{51}}$$

$$(3 \times 6) + (2 \times 1) + (6 \times 2) + (5 \times 6) = 12 + 2 + 12 + 30 = \underline{\underline{56}}$$

$$(3 \times 5) + (2 \times 3) + (6 \times 1) + (5 \times 4) = 15 + 6 + 6 + 20 = \underline{\underline{47}}$$

$$(6 \times 2) + (1 \times 3) + (4 \times 6) + (1 \times 1) = 12 + 3 + 24 + 1 = \underline{\underline{40}}$$

$$(6 \times 1) + (1 \times 5) + (4 \times 3) + (1 \times 4) = 6 + 5 + 12 + 4 = \underline{\underline{27}}$$

$$(6 \times 4) + (1 \times 1) + (4 \times 2) + (1 \times 6) = 24 + 1 + 8 + 6 = \underline{\underline{39}}$$

$$(6 \times 5) + (1 \times 3) + (4 \times 1) + (1 \times 4) = 30 + 3 + 4 + 4 = \underline{\underline{41}}$$

$$(6 \times 2) + (3 \times 3) + (1 \times 6) + (2 \times 1) = 8 + 9 + 6 + 2 = \underline{\underline{25}}$$

$$(6 \times 1) + (3 \times 5) + (1 \times 3) + (2 \times 6) = 6 + 15 + 3 + 12 = \underline{\underline{30}}$$

$$(6 \times 4) + (3 \times 1) + (1 \times 2) + (2 \times 6) = 16 + 3 + 2 + 12 = \underline{\underline{33}}$$

$$(6 \times 5) + (3 \times 3) + (1 \times 1) + (2 \times 4) = 30 + 9 + 1 + 8 = \underline{\underline{48}}$$

$$= \begin{bmatrix} 32 & 64 & 31 & 34 \\ 53 & 51 & 56 & 47 \\ 40 & 27 & 39 & 41 \\ 25 & 30 & 33 & 38 \end{bmatrix}$$

$$A \times \vec{J} = \begin{bmatrix} 1 & 5 & 2 & 3 \\ 3 & 2 & 6 & 5 \\ 6 & 1 & 4 & 1 \\ 4 & 3 & 1 & 2 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix} = \begin{aligned} (1 \times 1) + (5 \times 2) + (2 \times 3) + (3 \times 4) &= 1 + 10 + 6 + 12 = \underline{\underline{29}} \\ (3 \times 1) + (2 \times 2) + (6 \times 3) + (5 \times 4) &= 3 + 4 + 18 + 20 = \underline{\underline{45}} \\ (6 \times 1) + (1 \times 2) + (4 \times 3) + (1 \times 4) &= 6 + 2 + 12 + 4 = \underline{\underline{24}} \\ (4 \times 1) + (3 \times 2) + (1 \times 3) + (2 \times 4) &= 4 + 6 + 3 + 8 = \underline{\underline{21}} \end{aligned}$$

$$= \begin{bmatrix} 29 \\ 45 \\ 24 \\ 21 \end{bmatrix}$$