① 1) $a = (0, 1, 2, 3) \quad b = \begin{pmatrix} 9 \\ 8 \\ 7 \\ 6 \end{pmatrix}$

$a \cdot 2 = (0, 2, 4, 6)$

$a^T = \begin{pmatrix} 0 \\ 1 \\ 2 \\ 3 \end{pmatrix}$

$a \cdot b = 0 \cdot 9 + 1 \cdot 8 + 2 \cdot 7 + 3 \cdot 6 = 49$

2) $(5E)^{-1} = \frac{1}{5} E$

② $A = \begin{vmatrix} 1 & 2 & 3 \\ 4 & 0 & 6 \\ 7 & 8 & 9 \end{vmatrix}$

$\det A = 1 \cdot 0 \cdot 9 + 3 \cdot 4 \cdot 8 + 2 \cdot 6 \cdot 7 - 3 \cdot 0 \cdot 7 - 1 \cdot 6 \cdot 8 - 2 \cdot 4 \cdot 9 = 60$

③ $A = \begin{vmatrix} 1 & 2 & 3 \\ 4 & 0 & 6 \\ 7 & 8 & 9 \end{vmatrix}$

$M = \begin{vmatrix} -48 & -6 & 32 \\ -6 & -12 & -6 \\ 12 & -6 & -8 \end{vmatrix} \qquad A_* = \begin{vmatrix} -48 & 6 & 32 \\ 6 & -12 & 6 \\ 12 & 6 & -8 \end{vmatrix} \qquad A_*^T = \begin{vmatrix} -48 & 6 & 12 \\ 6 & -12 & 6 \\ 32 & 6 & -8 \end{vmatrix}$

$A^{-1} = \frac{1}{\det A} \cdot A_*^T = \frac{1}{30} \begin{vmatrix} -24 & 3 & 6 \\ 3 & -6 & 3 \\ 16 & 3 & -4 \end{vmatrix}$

④ $a = (1, 5) \quad b = (2, 8)$

$a \cdot b = 1 \cdot 2 + 5 \cdot 8 = 42$

⑤ $a = (1, 5, 0) \quad b = (2, 8, 7) \quad c = (7, 1.5, 3) \qquad (a \times b) \cdot c$

$\begin{vmatrix} i & j & k \\ 1 & 5 & 0 \\ 2 & 8 & 7 \end{vmatrix} = 35i - 7j - 2k$

$(35, -7, -2) \cdot (7, 1.5, 3)$

$35 \cdot 7 + (-7) \cdot 1{,}5 + (-2) \cdot 3 = 228{,}5$