

① $D = \begin{bmatrix} 0 & 2 & 0 \\ 3 & 0 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ has orthogonal columns, Day 10

but D is not unitary because its columns do not have _____.

② Give an example of a 2×2 unitary matrix U such that U, U^2, U^3, U^4 all $\neq I_2$ but $U^5 = I_2$.

③ Find $\begin{bmatrix} 1 & 3 \\ 1 & 7 \end{bmatrix}^{-1}$ without a calculator.

④ $\begin{bmatrix} 3 \\ 1 \\ 4 \end{bmatrix} \begin{bmatrix} 1 & 2 & 5 \end{bmatrix} = \begin{bmatrix} ? & ? & ? \\ ? & ? & ? \\ ? & ? & ? \end{bmatrix}$ (compute it!)

is NOT invertible because its columns are _____.

⑤ $((\overline{A} B)^t C)^{-1}$ equals _____.

Select the answer from below.

$\overline{(A^{-1})} (B^{-1})^t C^{-1}$, $C^{-1} (B^{-1})^t (A^{-1})^t$,

$(A^{-1})^* (B^{-1})^t C^{-1}$, $C^{-1} (B^{-1})^t (A^{-1})^*$,

$C^{-1} (A^{-1})^* (B^{-1})^t$, $C^{-1} \overline{(A^{-1})} (B^{-1})^t$.

(Exactly one of the six choices is correct.)

⑥ Is $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ unitary, self-adjoint, both, or neither?