Multiple choice questions - Inverse matrices and systems of equations

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Question 1 The inverse of $\begin{pmatrix} 2 & 1 \\ 1 & 1 \end{pmatrix}$ is:

- ○ **A.** $\begin{pmatrix} 1 & -1 \\ -1 & 2 \end{pmatrix}$
- ○ **B.** $\begin{pmatrix} 1 & 1 \\ 1 & 2 \end{pmatrix}$
- ○ **C.** $\begin{pmatrix} -1 & 1 \\ 1 & -2 \end{pmatrix}$
- ○ **D.** $\begin{pmatrix} 2 & -1 \\ -1 & 1 \end{pmatrix}$

Question 2 $(\mathbf{AB})^{-1} =$

- ○ **A.** $\mathbf{A}^{-1}\mathbf{B}^{-1}$
- ○ **B.** $\mathbf{B}^{-1}\mathbf{A}^{-1}$
- ○ **C.** $\mathbf{BA}$
- ○ **D.** $\mathbf{A}^{-1} + \mathbf{B}^{-1}$

Question 3 If $\mathbf{XA} = \mathbf{B}$ then $\mathbf{X} =$

- ○ **A.** $\mathbf{A}^{-1}\mathbf{B}$
- ○ **B.** $\mathbf{BA}^{-1}$
- ○ **C.** $\mathbf{AB}$
- ○ **D.** $\mathbf{B} - \mathbf{A}$

Question 4 A system $\mathbf{Ax} = \mathbf{b}$ with $\det \mathbf{A} = 0$ has:

- ○ **A.** exactly one solution
- ○ **B.** no solution or infinitely many
- ○ **C.** exactly two solutions
- ○ **D.** always no solution

Question 5 If $\det \mathbf{A} = 4$ for a 3×3 matrix, $\det(2\mathbf{A}) =$

- ○ **A.** 8
- ○ **B.** 16
- ○ **C.** 32
- ○ **D.** 4

Question 6 Three planes forming a triangular prism correspond to:

- ◯ **A.** a unique solution
- ◯ **B.** infinitely many solutions
- ◯ **C.** no solution
- ◯ **D.** det nonzero

Question 7 The determinant of the inverse of $\mathbf{A}$ with $\det \mathbf{A} = 5$ is:

- ◯ **A.** 5
- ◯ **B.** -5
- ◯ **C.** $\frac{1}{5}$
- ◯ **D.** $\frac{1}{25}$

Question 8 For $\mathbf{A} = \begin{pmatrix} k & 2 \\ 3 & 6 \end{pmatrix}$, $\mathbf{A}^{-1}$ does not exist when $k =$

- ◯ **A.** 1
- ◯ **B.** 2
- ◯ **C.** 0
- ◯ **D.** -1

Question 9 The adjugate matrix is the:

- ◯ **A.** inverse
- ◯ **B.** transpose of the cofactor matrix
- ◯ **C.** matrix of minors
- ◯ **D.** determinant

Question 10 If $\mathbf{A}^2 = 2\mathbf{A} - \mathbf{I}$ then $\mathbf{A}^{-1} =$

- ◯ **A.** $\mathbf{A}$
- ◯ **B.** $2\mathbf{I} - \mathbf{A}$
- ◯ **C.** $\mathbf{A} - 2\mathbf{I}$
- ◯ **D.** $\mathbf{I} - 2\mathbf{A}$

Answer grid - Inverse matrices and systems of equations

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Question	Answer	Explanation
1	**A**	$\det = 1$; swap the diagonal and negate the others.
2	**B**	Order reverses.
3	**B**	Multiply both sides on the right by $\mathbf{A}^{-1}$.
4	**B**	Singular means no unique solution.
5	**C**	$2^3 \times 4 = 32$.
6	**C**	No common point.
7	**C**	$\det \mathbf{A}^{-1} = 1/\det \mathbf{A}$.
8	**A**	$\det = 6k - 6 = 0$ gives $k = 1$.
9	**B**	Cofactors then transpose.
10	**B**	$\mathbf{A}(2\mathbf{I} - \mathbf{A}) = 2\mathbf{A} - \mathbf{A}^2 = \mathbf{I}$.