

NAME:

Group Number/Instructor name:

ID:

- Duration of the exam: 90 minutes
- Simple calculators are allowed

Question	Grade
I	
II	
III	
IV	
Total	

Question	1	2	3	4	5
Answer					

I) Choose the correct answer (write it on the table above):

1) If $A^3 - 2B^T = \begin{bmatrix} 18 & -2 \\ -6 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -5 & 3 \\ 1 & 0 \end{bmatrix}$, then the matrix A is

(A) $A = \begin{bmatrix} 2 & 0 \\ 0 & 1 \end{bmatrix}$	(B) $A = \begin{bmatrix} 2 & 1 \\ 0 & 1 \end{bmatrix}$	(C) $A = \begin{bmatrix} 4 & 0 \\ 0 & 1 \end{bmatrix}$	(D) None
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2) If $A^T = \begin{bmatrix} 1 & 1 \\ 2 & 3 \end{bmatrix}$ and $p(x) = x^2 - x + 3$, then $p(A)$ equals

(A) $\begin{bmatrix} 5 & 3 \\ 6 & 11 \end{bmatrix}$	(B) $\begin{bmatrix} 5 & 11 \\ 3 & 6 \end{bmatrix}$	(C) $\begin{bmatrix} 5 & 6 \\ 3 & 11 \end{bmatrix}$	(D) None
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3) The values of x and y for which the matrix $\begin{bmatrix} x^2 & 0 & x^2 - 4 \\ -1 & 3 & 2y - 6 \\ 1 & 7 & 2x - 5y \end{bmatrix}$ is lower triangular are

(A) $x = 2, y = 3$	(B) $x = \pm 2, y = 3$	(C) $x = \pm 2, y = \pm 3$	(D) None
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4) For any $\mathbf{b} = \begin{bmatrix} b_1 \\ b_2 \end{bmatrix}$, the solution of the system $\begin{cases} -x + 2y = b_1 \\ 2x + 6y = b_2 \end{cases}$ is

(A) a point	(B) a line	(C) a plane	(D) None
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5) The trace of of the matrix $\begin{bmatrix} 2 & 0 & 3 \\ -1 & 4 & 0 \\ 0 & -3 & 1 \end{bmatrix}$ is

(A) (2, 4, 1)	(B) 7	(C) 6	(D) None
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II) Determine whether the following is **True** or **False**.

(1) If A is a symmetric matrix, then A^2 is symmetric. ()

(2) The following system of equations is linear. ()

$$\begin{aligned}\sqrt{3}x + 2y - \cos z &= 0 \\ \sqrt{3} - x + 2y + z &= 1\end{aligned}$$

(3) If A and B are $n \times n$ matrices, then

$$(A + B)^2 - (A - B)^2 = 4AB.$$

()

(4) If A is an upper triangular matrix, then the matrix $A - A^T$ is diagonal. ()

(5) If A and B are square matrices of the same size, such that $A + B$ is symmetric, then both A and B are symmetric. ()

(6) If $D^3 = \begin{bmatrix} 8 & 0 \\ 0 & -1 \end{bmatrix}$, then $D^2 = \begin{bmatrix} 4 & 0 \\ 0 & 1 \end{bmatrix}$. ()

III) Solve the linear system of equations

$$\begin{cases} x - y + 3z + 2w = 1 \\ -2x + y + 5z + w = 2 \\ -3x + 2y + 2z - w = 1 \\ 4x - 4y + 7z + 18w = 9 \end{cases}$$

IV) Let $A = \begin{bmatrix} 1 & 3 & 1 \\ 2 & 2 & 1 \\ 2 & 3 & 1 \end{bmatrix}$

a) Find A^{-1} .

b) Find the matrix B , if $AB = C$, where $C = \begin{bmatrix} -1 & 0 \\ 0 & 1 \\ -2 & 0 \end{bmatrix}$.

Scrap paper. This page will not be graded.