

King Saud University
Department of Mathematics

244
First Midterm Makeup, May 2016

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

2) If $A^T - I = \begin{bmatrix} 0 & 1 \\ 2 & 2 \end{bmatrix}$ 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
---	---	---	----------

3) The values of x and y for which the matrix $\begin{bmatrix} x^2 & 0 & x^2 - 1 \\ -1 & 3 & 2y + 6 \\ 1 & 7 & 2x - 5y \end{bmatrix}$ is lower triangular are

(A) $x = 1, y = 3$	(B) $x = \pm 1, y = -3$	(C) $x = \pm 1, y = \pm 3$	(D) None
--------------------	-------------------------	----------------------------	----------

4) For any $\mathbf{b} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$, the solution of the system $\begin{cases} -x + 2y + z = b_1 \\ 2x + 6y - 2z = b_2 \\ x + y - z = b_3 \end{cases}$ is

(A) a point	(B) a line	(C) a plane	(D) None
-------------	------------	-------------	----------

5) The trace of of the matrix $\begin{bmatrix} 2 & -1 & 5 \\ -1 & 4 & 3 \\ 1 & -2 & 1 \end{bmatrix}$ is

(A) (2, 4, 1)	(B) 7	(C) 6	(D) None
---------------	-------	-------	----------

II) Determine whether the following is **True** or **False**.

-
- (1) If A and B are square matrices of the same size and A is a symmetric matrix, then B is symmetric. ()

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

$$\begin{aligned}\sqrt{3}x + 2y - (\sin \pi)z &= 0 \\ \sqrt{3} - x + 2y + z &= 1\end{aligned}$$

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

$$(A + B)^3 = A^3 + B^3 + 3AB(A + B). \quad ()$$

-
- (4) If A is a lower 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 $D^2 = \begin{bmatrix} \cos(2x) & 0 \\ 0 & \sin(2x) \end{bmatrix}$, then $D = \begin{bmatrix} \cos x & 0 \\ 0 & \sin x \end{bmatrix}$. ()

III) Solve the linear system of equations

$$\left\{ \begin{array}{rclclclcl} x & - & y & + & 3z & + & 2w & = & 1 \\ 4x & - & 4y & + & 7z & + & 18w & = & 9 \\ -6x & + & 4y & + & 4z & - & 2w & = & 2 \\ -2x & + & y & + & 5z & + & w & = & 2 \end{array} \right.$$

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

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.