DigiPen Institute of Technology Singapore

IBF– Day 3 Exericise
Linear Algebra

Instructor: Yilin Wu

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Name: ____

This exercise contains 10 pages (including this cover page) and 15 questions. Total of points is 110. Good luck and Happy reading work!

Distribution of Marks

Question:	1	2	3	4	5	6	7	8
Points:	5	10	20	10	10	5	10	5
Score:								

Question:	9	10	11	12	13	14	15	Total
Points:	5	5	5	5	5	5	5	110
Score:								

1. (5 points) Show that the main diagonal of every skew symmetric matrix consists of only zeros.

2. (10 points) Give an example of a matrix A such that $A^2 = I$ and yet $A \neq I$ and $A \neq -I$.

3. (20 points) Let
$$A = \begin{bmatrix} 2 & 1 \\ -1 & 3 \end{bmatrix}$$
Find A^{-1} if possible. If it doesn't exist, explain why. Verify your result with Python

4. (10 points) Let
$$A = \begin{bmatrix} 0 & 1 \\ 5 & 3 \end{bmatrix}$$
Find A^{-1} if possible. If it doesn't exist, explain why. Verify your result with Python

5. (10 points) Let

$$A = \begin{bmatrix} 2 & 1 \\ 3 & 0 \end{bmatrix}$$

Find A^{-1} if possible. If it doesn't exist, explain why. Verify your result with Python

6. (5 points) Let

$$A = \begin{bmatrix} 2 & 1 \\ 4 & 2 \end{bmatrix}$$

Find A^{-1} if possible. If it doesn't exist, explain why. Verify your result with Python

7. (10 points) Let

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 1 & 0 & 2 \end{bmatrix}$$

Find A^{-1} if possible. If it doesn't exist, explain why. Verify your result with Python

8. (5 points) Let

$$A = \begin{bmatrix} 1 & 0 & 3 \\ 2 & 3 & 4 \\ 1 & 0 & 2 \end{bmatrix}$$

Find A^{-1} if possible. If it doesn't exist, explain why. Verify your result with Python.

9. (5 points) Let

$$A = \begin{bmatrix} 1 & 2 & 0 & 2 \\ 1 & 1 & 2 & 0 \\ 2 & 1 & -3 & 2 \\ 1 & 2 & 1 & 2 \end{bmatrix}$$

Find A^{-1} with Python.

10. (5 points) Using the inverse of the matrix, find the solution to the systems:

$$\begin{bmatrix} 2 & 4 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$$

Now give the solution in terms of a and b to

$$\begin{bmatrix} 2 & 4 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} a \\ b \end{bmatrix}$$

11. (5 points) Using the inverse of the matrix, find the solution to the systems:

$$\begin{bmatrix} 1 & 0 & 3 \\ 2 & 3 & 4 \\ 1 & 0 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$$

Now give the solution in terms of a, b, c to

$$\begin{bmatrix} 1 & 0 & 3 \\ 2 & 3 & 4 \\ 1 & 0 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} a \\ b \\ c \end{bmatrix}$$

12. (5 points) Let $A = \begin{bmatrix} 1 & 2 & 4 \\ 0 & 1 & 3 \\ -2 & 5 & 1 \end{bmatrix}$ Find the following.

1. $\text{minor}(A)_1 1$
2. $\text{minor}(A)_2 1$
3. $\text{minor}(A)_3 2$
4. $\text{cof}(A)_1 1$
5. $\text{cof}(A)_2 1$
6. $\text{cof}(A)_3 2$

13. (5 points) Find the determinants of the following matrices

1. $$A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 2 \\ 0 & 9 & 8 \end{bmatrix}$$

2. $$B = \begin{bmatrix} 4 & 3 & 2 \\ 1 & 7 & 8 \\ 3 & -9 & 3 \end{bmatrix}$$

3. $$C = \begin{bmatrix} 5 & -1 & 3 \\ 4 & 1 & 1 \\ 0 & 4 & -2 \end{bmatrix}$$

14. (5 points) Construct a 2 by 2 matrices A and B to show that

$$det A det B = det(AB)$$

15. (5 points) Is it true that $det(A + B) = det(A) + det(B)$? Give an counter example or explain why.

This page is intentionally left blank to accommodate work that wouldn't fit elsewhere and/or scratch work.