Unit 6 · Matrix and Determinant

HARDER WORKSHEET

Full marks 25

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 25

1 Multiple choice [3]

Choose the correct option for each of the following questions.

i. A is a 3×2 matrix. What is the order of $A^{\mathrm{T}}A$? [1]

a. 3×3 **b.** 2×2

c. 3×2 **d.** it can't be found

ii. A is a 2×2 matrix with $|A| = 4$. What is $|2A|$? [1]

a. 8 **b.** 6

c. 16 **d.** 4

iii. Which matrix is its own inverse? [1]

a. $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ **b.** $\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$

c. $\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$ **d.** $\begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$

2 Short answers [8]

Write short answers to the following questions.

a. Show that. For any 2×2 matrix $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$, show that $A + A^{\mathrm{T}}$ is a symmetric matrix. [2]

b. Find the mistake. Bikash writes: "For matrices, $(A + B)^2 = A^2 + 2AB + B^2$." Explain his mistake and write the correct expansion. [2]

c. Work backwards. Find the matrix X for which $\begin{pmatrix} 2 & 1 \\ 5 & 3 \end{pmatrix} X = \begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$. [2]

d. Show that. For a 2×2 matrix A and a number k, show that $|kA| = k^2|A|$. **[2]**

3 Long answers [12]

Solve the following problems. Show your working.

a. Solve the equations $3x + 2y = 12$ and $5x + 4y = 22$ by the inverse of a matrix. Check your answer. **[4]**

Answer:

b. $A = \begin{pmatrix} 3 & 1 \\ 2 & 4 \end{pmatrix}$. **[4]**

a. Find A^2, and the numbers k and m for which $A^2 + kA + mI = O$.

b. Use your equation to find A^{-1}, and check it with the formula.

Answer:

Science Playground, Katunje, Bhaktapur
https://science-playground.com/learn/grade-10-optional-math/matrix-and-determinant

c. The matrices $\begin{pmatrix} p & 2p-9 \\ -q & 3 \end{pmatrix}$ and $\begin{pmatrix} 3 & 5 \\ q & p \end{pmatrix}$ are inverses of each other. Find p and q. **[4]**

4 Think **[2]**

Think, then answer.

A and B are 2×2 matrices, $B \neq O$, and $AB = O$. Show that A must be singular.