

Determinants — Assignment 1

Class 12 Maths · Topic-wise question bank covering every concept of the chapter · Narayan Gurukul Academy

Instructions: (1) Attempt all questions. This worksheet walks through every concept of the chapter, topic by topic.
(2) The interactive MCQ version of these questions (with instant answer reveal) is available on the notes page.
(3) Universal values: $g = 10 \text{ m/s}^2$ unless stated. Give answers with correct SI units.

Expansion of Determinants

MCQ Questions (choose the correct option)

- The value of $|\begin{bmatrix} a & b \\ c & d \end{bmatrix}|$ is
 - $ad - bc$
 - $ab - cd$
 - $ac - bd$
 - $ad + bc$
- A determinant of order 3 has
 - 3 rows and 3 columns
 - 2 rows and 3 columns
 - 3 rows and 2 columns
 - 1 row and 3 columns
- The determinant of a 1×1 matrix $[a]$ is
 - a
 - 0
 - 1
 - $-a$
- The minor of an element a_{ij} is
 - the determinant left after deleting its row and column
 - the element itself
 - the cofactor sign
 - the whole determinant

1 Mark Questions

- Evaluate $|\begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}|$.
- What is the order of a 3×3 determinant?
- Define the minor of an element.

2 Mark Questions

- Evaluate $|\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}|$.
- Find the value of $|\begin{bmatrix} 2 & 0 \\ 0 & 5 \end{bmatrix}|$.

3 Mark Questions

- Evaluate the determinant $|\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}|$.
- Find the determinant $|\begin{bmatrix} 2 & -1 & 3 \\ 0 & 1 & 4 \\ 5 & 2 & -2 \end{bmatrix}|$.

Properties of Determinants

MCQ Questions (choose the correct option)

1. If any two rows of a determinant are interchanged, its value
 - (A) changes sign
 - (B) remains the same
 - (C) becomes zero
 - (D) doubles
2. If two rows of a determinant are identical, its value is
 - (A) 0
 - (B) 1
 - (C) -1
 - (D) undefined
3. If each element of a row is multiplied by k , the determinant is
 - (A) multiplied by k
 - (B) divided by k
 - (C) unchanged
 - (D) squared
4. If each element of a row is added to another row, the determinant
 - (A) is unchanged
 - (B) changes sign
 - (C) doubles
 - (D) becomes zero

1 Mark Questions

1. What happens to a determinant if two rows are interchanged?
2. What is the value of a determinant with two identical rows?
3. If a row is multiplied by k , what happens to the determinant?

2 Mark Questions

1. Prove that $|\begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}| = 0$ using properties.
2. Evaluate $|\begin{bmatrix} a & b \\ b & a \end{bmatrix}|$.

3 Mark Questions

1. Show that $|\begin{bmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{bmatrix}| = (a - b)(b - c)(c - a)$.
2. Using properties, prove that $|\begin{bmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{bmatrix}| = (a - b)(b - c)(c - a)$.

Adjoint, Inverse and Singular Matrices**MCQ Questions (choose the correct option)**

1. $A \cdot \text{adj}(A)$ equals
 - (A) $|A| I$
 - (B) A
 - (C) $\text{adj}(A)$
 - (D) 0
2. A square matrix A is singular if

- (A) $|A| = 0$
 (B) $|A| \neq 0$
 (C) A is symmetric
 (D) $A = I$
3. The inverse of A exists if
 (A) $|A| \neq 0$
 (B) $|A| = 0$
 (C) $A = 0$
 (D) A is singular
4. A^{-1} equals
 (A) $\text{adj}(A)/|A|$
 (B) $|A| \text{adj}(A)$
 (C) $\text{adj}(A)$
 (D) $1/|A|$

1 Mark Questions

- Write the relation between A and $\text{adj}(A)$.
- When is a matrix singular?
- Write the formula for A^{-1} .

2 Mark Questions

- Find the adjoint of $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.
- Find $|A|$ and state whether $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ is invertible.

3 Mark Questions

- Find A^{-1} for $A = \begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$.
- Find the inverse of $A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 3 & 1 \\ 1 & 1 & 1 \end{bmatrix}$.

Solving Linear Equations with Cramer's Rule

MCQ Questions (choose the correct option)

- Cramer's rule solves a system using
 (A) determinants
 (B) matrices only
 (C) graphs
 (D) vectors
- For the system $a_1x + b_1y = c_1$, $a_2x + b_2y = c_2$, x equals
 (A) Δ_x/Δ
 (B) Δ/Δ_x
 (C) $\Delta_x \cdot \Delta$
 (D) $\Delta_x + \Delta$
- The system has a unique solution if
 (A) $\Delta \neq 0$
 (B) $\Delta = 0$
 (C) $\Delta_x \neq 0$

- (D) all coefficients zero
4. If $\Delta = 0$ and $\Delta_x \neq 0$, the system
- (A) is inconsistent
 - (B) has a unique solution
 - (C) has infinite solutions
 - (D) is always consistent

1 Mark Questions

1. State the condition for a unique solution by Cramer's rule.
2. Define Δ in Cramer's rule.
3. When is a system inconsistent?

2 Mark Questions

1. Solve $x + y = 5$, $x - y = 1$ using determinants.
2. Solve $2x + y = 4$, $x + y = 3$ by Cramer's rule.

3 Mark Questions

1. Solve $2x + 3y = 5$, $x - y = 1$ using Cramer's rule.
2. Solve $x + y + z = 6$, $x - y + z = 2$, $2x + y - z = 1$ using Cramer's rule.

Area of a Triangle

MCQ Questions (choose the correct option)

1. The area of a triangle with vertices (x_1, y_1) , (x_2, y_2) , (x_3, y_3) is
 - (A) $\frac{1}{2} |\det|$
 - (B) $|\det|$
 - (C) $2|\det|$
 - (D) $\det$
2. If three points are collinear, the area of the triangle is
 - (A) 0
 - (B) 1
 - (C) $\frac{1}{2}$
 - (D) undefined
3. The determinant formula for the area uses
 - (A) coordinates of the vertices
 - (B) side lengths
 - (C) angles
 - (D) circumradius
4. The area is taken as the
 - (A) absolute value of the determinant
 - (B) negative of the determinant
 - (C) square of the determinant
 - (D) half the determinant without absolute value

1 Mark Questions

1. Write the formula for the area of a triangle using determinants.
2. When is the area of a triangle zero?
3. Find the area of a triangle with one vertex at the origin and others at $(1, 0)$, $(0, 1)$.

2 Mark Questions

1. Find the area of the triangle with vertices $(0, 0)$, $(1, 0)$, $(0, 1)$.
2. Find the area of the triangle with vertices $(1, 1)$, $(2, 2)$, $(3, 3)$ and comment.

3 Mark Questions

1. Find the area of the triangle with vertices $(1, 0)$, $(2, 2)$, $(0, 3)$.
2. Using determinants, show that the points $(1, 2)$, $(3, 4)$ and $(5, 6)$ are collinear.