

PM SHRI KENDRIYA VIDYALAYA NO.1 ROORKEE

AUTUMN BREAK HOLIDAY HOMEWORK

Mathematics | Class 12

Session 2026-27

Autumn Break: 15 October 2026 to 24 October 2026 (10 days)

Instructions for Students

1. Attempt one worksheet each day. Do all the work neatly in your Maths notebook.
2. Write the question number and then the complete solution, showing each step.
3. Draw diagrams and graphs with a pencil and ruler wherever needed.
4. Revise the chapter from the textbook before starting that day's worksheet.
5. This is revision work only, based on what has already been taught in class.

Day 1: Relations and Functions

1. Check whether $f : \mathbb{R} \rightarrow \mathbb{R}$, $f(x) = 3x + 2$ is one-one.
2. Show that $f(x) = x^2$ is not one-one on $\mathbb{R}$.
3. Find the inverse of $f(x) = 2x + 3$.
4. Check whether the relation $R = \{(1,1), (2,2), (3,3), (1,2)\}$ on $\{1, 2, 3\}$ is reflexive, symmetric and transitive.
5. Show that $f : \mathbb{R} \rightarrow \mathbb{R}$, $f(x) = 5x + 3$ is bijective.
6. Let $A = \{1, 2, 3\}$. Find the number of one-one functions from A to A .
7. If $f(x) = x + 3$ and $g(x) = x^2$, find $f \circ g(x)$ and $g \circ f(x)$.
8. Show that $f : \mathbb{N} \rightarrow \mathbb{N}$, $f(x) = 2x$ is one-one but not onto.

Day 2: Inverse Trigonometric Functions

1. Find the principal value of $\sin^{-1} 91/2$.
2. Find the value of $\cos^{-1} (-1/2)$.
3. Evaluate: $\tan^{-1} (1)$.
4. Find the value of $\sin^{-1} (\sin(2\pi/3))$.
5. Evaluate: $\cos^{-1} (\cos(7\pi/6))$.
6. Prove: $\tan^{-1} (1) + \tan^{-1} (2) + \tan^{-1} (3) = \pi$.
7. Find the value of $\sin(\cos^{-1}(3/5))$.
8. Evaluate: $\tan^{-1}\sqrt{3} - \cot^{-1} (-\sqrt{3})$.

Day 3: Matrices

1. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 0 \\ 1 & 3 \end{bmatrix}$, find $A + B$.
2. Find $2A$ where $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.
3. Write the order of a matrix with 3 rows and 4 columns.
4. Find AB where $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 0 \\ 1 & 3 \end{bmatrix}$.
5. Find the transpose of $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$.

6. If $A = \begin{bmatrix} 2 & 3 \\ 1 & -1 \end{bmatrix}$, find A^2 .
7. Find x and y if $\begin{bmatrix} x & 3 \\ 2 & y \end{bmatrix} = \begin{bmatrix} 5 & 3 \\ 2 & 4 \end{bmatrix}$
8. Show that the matrix $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is symmetric.

Day 4: Determinants

1. Find the determinant of $\begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$.
2. Find the determinant of $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$
3. Find the value of x if $\begin{vmatrix} x & 2 \\ 3 & 4 \end{vmatrix} = 10$.
4. Find the area of the triangle with vertices $(0, 0)$, $(3, 0)$ and $(0, 4)$ using determinants.
5. Find the adjoint of $A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$.
6. Find the inverse of $A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$
7. Solve using Cramer's rule: $x + y = 5$ and $x - y = 1$.

Day 5: Continuity and Differentiability

1. Differentiate: $x^3 + 2x^2 - 5$.
2. Differentiate: $\sin x + \cos x$.
3. Find dy/dx if $y = e^x + \log x$.
4. Differentiate: $y = x \sin x$.
5. Check the continuity of $f(x) = |x|$ at $x = 0$.
6. Differentiate: $y = (2x + 3)^x$.
7. Find dy/dx if $y = \tan x$.
8. Differentiate: $y = x^2 e^x$.

Day 6: Applications of Derivatives

1. Find the maximum value of $f(x) = -(x - 1)^2 + 5$.
2. Find the interval in which $f(x) = x^2 - 4x$ is increasing.
3. Find the critical points of $f(x) = x^3 - 3x$.
4. The radius of a circle is increasing at 2 cm/s. Find the rate of increase of its area when $r = 5$ cm.
5. Find the local minimum of $f(x) = x^2 - 6x + 5$.
6. Find two positive numbers whose sum is 16 and whose product is maximum

Day 7: Integrals

1. Evaluate: integral of $x^2 dx$.
2. Evaluate: integral of $(2x + 3) dx$.
3. Evaluate: integral of $(1/x) dx$.
4. Evaluate: integral of $\sin x dx$.
5. Evaluate: integral $\int_0^1 x dx$.

6. Evaluate: integral of $(x^2 + 1/x) dx$.

7. Evaluate: integral $\int_0^{\pi/2} \cos x dx$

Day 8: Application of Integrals

1. Find the area bounded by $y = x^2$, the x-axis, $x = 0$ and $x = 3$.
2. Find the area of the circle $x^2 + y^2 = 9$ using integration.
3. Find the area bounded by $y = x$, the x-axis and $x = 4$.
4. Find the area enclosed between $y = x^2$ and $y = x$.
5. Find the area of the region bounded by $y = \sqrt{x}$, the x-axis, $x = 0$ and $x = 4$.
6. Find the area bounded by the ellipse $x^2/16 + y^2/9 = 1$.
7. Find the area of the triangle bounded by $y = 2x$, the x-axis and $x = 3$.
8. Find the area bounded by $y = x^2$, $x = 1$, $x = 2$ and the x-axis.

Day 9: Differential Equations

1. Find the order and the degree of $d^2y/dx^2 + (dy/dx)^3 + y = 0$.
2. Solve: $dy/dx = 2x$.
3. Solve: $dy/dx = y/x$.
4. Find the order and the degree of $(dy/dx)^2 + y = 0$.
5. Solve: $dy/dx + y = 0$.
6. Verify that $y = e^x$ is a solution of $dy/dx - y = 0$.
7. Solve: $dy/dx = \cos x$.
8. Find the integrating factor of $dy/dx + y/x = x$.

Day 10: Vector Algebra and Mixed Revision

1. Find the magnitude of the vector $3i + 4j$.
 2. Find the unit vector in the direction of $6i + 8j$.
 3. Find the dot product of $(i + 2j)$ and $(3i + j)$.
 4. Find the cross product of i and j .
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