



Indian School Al Wadi Al Kabir

Unit Test (2026- 27)

Mathematics (set 1)

Class: XII

Date: 18-05-2026

Max. Marks: 30

Time: 1 Hr.

General Instructions:

1. This question paper is divided into 4 sections- A, B, C and D.
2. Section A comprises of 7 questions of 1 mark each.
3. Section B comprises of 3 questions of 2 marks each.
4. Section C comprises of 3 questions of 3 marks each.
5. Section D comprises of 2 case study-based question.
6. Internal choices have been provided.

SECTION - A

1.	If A is a 3×3 square matrix and A = -2 then the value of adj(adjA) :								(1m)
	A.	4	B.	-4	C.	16	D.	-16	
2.	The determinant of the matrix $A = \begin{bmatrix} 0 & -e^{-\pi x} + e^{\tan x} & -e^{\tan \pi x} + e^{-x} \\ e^{-\pi x} - e^{\tan x} & 0 & -\cos \pi x \\ e^{\tan \pi x} - e^{-x} & \cos \pi x & 0 \end{bmatrix}$ is:								(1m)
	A.	$2(e^{-\pi x} - e^{\tan x})$			B.	$2(-e^{\tan \pi x} + e^{-x})$			
	C.	1			D.	0			
3.	If $A = \begin{bmatrix} \cos x & \sin x \\ \sin x & \cos x \end{bmatrix}$ then the value of $\frac{d}{dx} (A)$ at $x = \frac{\pi}{4}$ is:								(1m)
	A.	1	B.	-2	C.	0	D.	$\sqrt{2}$	
4.	The function $f(x) = kx - \sin x$ is strictly increasing if:								(1m)
	A.	$k > 1$	B.	$k < 1$	C.	$k < -1$	D.	$k > -1$	
5.	If $y = \log(\log(\log x^5))$, then $\frac{dy}{dx}$:								(1m)
	A.	$\frac{1}{(\log(\log x^5))}$			B.	$\frac{x^4}{(\log(\log x^5))}$			
	C.	$\frac{5}{x \cdot \log x^5 (\log(\log x^5))}$			D.	$\frac{5x}{(\log(\log x^5))}$			
6.	Which of the following is an incorrect statement?								(1m)
	A.	$(kABC)^T = k C^T B^T A^T$, for k being a real number.			B.	If A and B are any two non-zero matrices, then BA can be a zero matrix.			
	C.	$(A^{-1})^T = (A^T)^{-1}$			D.	Matrix multiplication is possible only when the matrices are of the same order.			

7.	Assertion and reasoning: Assertion(A): $f(x) = x+1 - x+2 + x+3 - x+4 $ is a continuous function. Reason(R): Every continuous function is differentiable but the converse need not be true. A) Both (A) and (R) are true and (R) is the correct explanation of (A) B) Both (A) and (R) are true but (R) is not the correct explanation of (A) C) (A) is true but (R) is false D) (A) is false but (R) is true	(1m)
SECTION - B		
8.	If $x = t + \frac{1}{t}$ and $y = t - \frac{1}{t}$ then find $\frac{dy}{dx}$ at $t = 2$.	(2m)
9.	(a) A spherical balloon loses air due to leakage in such a way that the rate of decrease in volume at any instant is proportional to its surface area. Show that the radius is decreasing at a constant rate. OR (b) Amongst of all pairs of positive integers, with product is 256, find which of the two numbers add up to the least. Justify your answer.	(2m)
10.	If $A = \begin{pmatrix} 1 & 0 & -2 \\ 0 & -1 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} -1 \\ 0 \\ -1 \end{pmatrix}$ find AB and BA if exists.	(2m)
SECTION – C		
11.	$(\sin x)^y = y^{\cos x}$, find $\frac{dy}{dx}$.	(3m)
12.	Express the matrix $A = \begin{bmatrix} 0 & 4 & 2 \\ 1 & 2 & -5 \\ 6 & 0 & 1 \end{bmatrix}$ as the sum of symmetric and skew-symmetric matrices.	(3m)
13.	(a) $xy = e^{x-y}$, then find $\frac{dy}{dx}$. OR (b) If $x\sqrt{1+y} + y\sqrt{1+x} = 0$, $-1 < x < 1$, prove $\frac{dy}{dx} = -\frac{1}{(1+x)^2}$.	(3m)

SECTION – D (Case Study-based questions)

14.	A housing society wants to commission a swimming pool for its residents. For this, they have to purchase a square piece of land and dig this to such a depth that its capacity is 250 cubic metres. Cost of land is rupees 500 per square metre. The cost of digging increases with the depth and cost for the whole pool is rupees 4000 (depth)².  Suppose the side of the square plot is x metres and depth is h metres. On the basis of the above information, answer the following questions: (i) Write cost $C(h)$ as a function in terms of h. (1m) (ii) Find critical point. (1m) (iii) (a) Use second derivative test to find the value of h for which cost of constructing the pool is minimum. What is the minimum cost of construction of the pool? (2m) OR (b) Use first derivative test to find the depth of the pool so that cost of construction is minimum. Also, find relation between x and h for minimum cost. (2m)	
15.	A professional typist having his shop in a busy market, charges ₹ 200 for typing 8 English and 4 Hindi pages, while he charges ₹ 275 for typing 5 English and 10 Hindi pages. Based on the above information, answer the following questions: (i) If he charges ₹ x for one page of English and ₹ y for one page of Hindi, express the above as a pair of linear equations. (1m) (ii) Express the information in terms of matrix equation $AX = B$. (1m) (iii) (a) Find A and $(\text{adj } A)$. (2m) OR (b) Find the values of x & y (2m)	
