



INDIAN SCHOOL AL WADI AL KABIR
Assessment-1 (2026 - 2027)

Class: XII

Sub: MATHEMATICS (041)

Max Marks: 80

Date: 22.09.2026

Set- 1

Time: 3 hours

General Instructions:

1. This question paper is divided in to 5 sections- A, B, C, D and E
2. Section A comprises of 20 questions of 1 mark each.
3. Section B comprises of 5 questions of 2 marks each.
4. Section C comprises of 6 questions of 3 marks each.
5. Section D comprises of 4 questions of 5 marks each.
6. Section E comprises of 3 case study-based question.
7. Internal choice has been provided.

SECTION – A

- 1 The total number of reflexive relations defined on a set A if $n(A) = 5$: (1m)
A 125 B 2^{20} C 2^{25} D 2^{125}
- 2 If $|A| = 3$ for a A_3 matrix, then $|2A|^2 =$ (1m)
A 576 B 676 C 24 D 12
- 3 The product $\begin{bmatrix} a & b \\ -b & a \end{bmatrix} \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$ is equal to (1m)
A $\begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$ B $\begin{bmatrix} a^2 + b^2 & 0 \\ a^2 + b^2 & 0 \end{bmatrix}$ C $\begin{bmatrix} (a+b)^2 & 0 \\ (a+b)^2 & 0 \end{bmatrix}$ D $\begin{bmatrix} a^2 + b^2 & 0 \\ 0 & a^2 + b^2 \end{bmatrix}$
- 4 Let A be a 3×3 matrix such that $|\text{adj } A| = 64$. Then $|A|$ is equal to : (1m)
A 8 only B -8 only C 8 or -8 D 64
- 5 The principal value of $\cos^{-1}\left(\cos \frac{7\pi}{6}\right)$: (1m)
A $\frac{7\pi}{6}$ B $\frac{\pi}{6}$ C $\frac{5\pi}{6}$ D $\frac{-\pi}{6}$
6. If $2\cos^{-1}x = y$ then (1m)
A $0 \leq y \leq \pi$ B $0 \leq y \leq 2\pi$ C $-\pi \leq y \leq 0$ D $-\pi \leq y \leq \pi$
7. Sum of any positive real number and its reciprocal is always (1m)
A ≤ 2 B ≥ 2 C ≥ 0 any real number
- 8 If A is a 5×7 matrix and B is a matrix such that $A'B$ and AB' are both defined, then the order of the matrix B is (1m)
A 5×7 B 5×5 C 7×5 D 7×7

9. The derivative of e^{3x+4} with respect to e^x is
 A $3e^{3x+4}$ B $3e^{2x+4}$ C $3e^{x+4}$ D e^{3x+4} (1m)
10. If $f(x) = \sin^5 x + \frac{1}{x^3} + \tan^5 x - x$ then $\int_{-1}^1 f(x) dx =$ (1m)
 A -1 B 0 C 1 D $\frac{\pi}{2} - 1$
11. The value of 'k' for which the function $f(x) = \begin{cases} \frac{(x+3)^2-36}{x-3}, & x \neq 3 \\ k, & x = 3 \end{cases}$ is continuous at $x = 3$ (1m)
 A 11 B -3 C 12 D 3
12. If $y = \log(\log x^5)$, then $\frac{dy}{dx}$: (1m)
 A $\frac{5}{x}$ B $\frac{5x^4}{\log x^5}$ C $\frac{5}{\log x}$ D $\frac{1}{x \cdot \log x}$
13. $\int \sqrt{1 - \sin 2x} dx$ when $0 < x < \frac{\pi}{4} =$ (1m)
 A $\sin x - \cos x + c$ B $-\sin x - \cos x + c$ C $-\sin x + \cos x + c$ D $\sin x + \cos x + C$
14. $\int \cos^{-1}\left(\frac{\cos x - \sin x}{\sqrt{2}}\right) dx =$ (1m)
 A $\frac{x^2}{2} - \frac{\pi}{4} + C$ B $\frac{x^2}{2} + \frac{\pi}{4}x + C$ C $\frac{-x^2}{2} - \frac{\pi}{4} + C$ D $\frac{x^2}{2} - \frac{\pi^2}{4} + C$
15. The values of a for which the function f given by $f(x) = x^2 + ax + 1$ is increasing on $[1, 2]$ (1m)
 A $[-2, \infty)$ B $[-4, \infty)$ C $[-4, -2]$ D $(-4, -2)$
16. $\int_0^1 x e^x dx$ equals: (1m)
 A 0 B 1 C e D $-e$
17. The relation "Is husband of" is (1m)
 A Reflexive and Symmetric but not transitive B Symmetric and transitive but not reflexive
 C Reflexive only D Transitive only
18. Domain of the function $y = \cos^{-1}(x^2 - 2)$ is (1m)
 A $[-\sqrt{3}, -1] \cup [1, \sqrt{3}]$ B $[1, \sqrt{3}]$
 C $[-\sqrt{3}, -1]$ D $R - [-\sqrt{3}, -1] \cup [1, \sqrt{3}]$
19. **Assertion:** The function $f: R - \{-1\} \rightarrow R$ defined as $f(x) = \frac{x-1}{x+1}$ is a bijection. (1m)
Reason: A function f is said to be a bijection if it is both one to one and onto.
 (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

20. **Assertion:** If A is a 3×3 square matrix and $|A|=3$ then $|\text{adj}(\text{adj}A)|=81$ (1m)
Reason: If A is a square matrix of order n, then $|\text{adj}A|=|A|^{n-1}$
 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

SECTION - B

21. If matrix $A = \begin{bmatrix} 3 & -3 \\ -3 & 3 \end{bmatrix}$ and $A^2 = \lambda A$, then write the value of λ . (2m)
22. (a) Evaluate: $\cot^{-1} \left(\frac{\cos 3x - \sin 3x}{\cos 3x + \sin 3x} \right)$, $0 < x < \frac{\pi}{6}$ (2m)
OR
 (b) Evaluate: $\tan \left[\sin^{-1} 1 - \cos^{-1} \left(\frac{-1}{2} \right) \right]$ (2m)
23. Evaluate: $\int \frac{x^2}{\sqrt{1-x^2}} dx$ (2m)
24. A room freshener bottle in the shape of an inverted cone sprays the perfume at regular intervals such that volume of the perfume in the bottle decreases at the steady rate of $1\text{mm}^3/\text{min}$. find the rate at which level of perfume is dropping at an instant when level of perfume in the bottle is 10mm, if the semi-vertical angle of the cone conical bottle is $\frac{\pi}{6}$. (2m)
25. (a) Find $\frac{dy}{dx}$, if $y = \sin^{-1} \left(\frac{4\sqrt{5}x - 2\sqrt{1-16x^2}}{3} \right)$. (2m)
OR
 (b) If $\sqrt{3}(x^2 + y^2) = 4xy$, then find $\frac{dy}{dx}$ at $\left(\frac{1}{2}, \frac{\sqrt{3}}{2} \right)$ (2m)

SECTION - C

26. Let R is a relation on set $A = \{0, 1, 2, 3, \dots, 12\}$ such that $R = \{(x, y): |x - y| \text{ is divisible by } 4, x, y \in A\}$. Prove R is an equivalence relation. (3m)
27. Find: $\int (\sin^{-1} x)^2 dx$ (3m)
OR
 Find: $\int_0^\pi \frac{x}{p^2 \sin^2 x + q^2 \cos^2 x} dx$ (3m)
28. Prove that: $\cot^{-1} \left(\frac{\sqrt{1+x} - \sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}} \right) = \frac{\pi}{4} + \frac{1}{2} \cos^{-1} x$, $\frac{-1}{\sqrt{2}} \leq x \leq 1$ (3m)
29. Find the maximum value of $2x^3 - 24x + 107$ in the interval $[1, 3]$. Find the maximum value of the same function in $[-3, -1]$. (3m)
30. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, then show that $A^2 - 5A + 7I = O$ and hence find A^{-1} . (3m)

31. Let $f(x) =$ (3m)

$$\begin{cases} \frac{1 - \cos 4x}{x^2}, & \text{if } x < 0 \\ a, & \text{if } x = 0 \\ \frac{\sqrt{x}}{\sqrt{\sqrt{x} + 16} - 4}, & \text{if } x > 0 \end{cases}$$

For what value of 'a', f is continuous at $x = 0$

OR

If $y = (\cos x)^{(\cos x)^{(\cos x)^{\dots \dots \infty}}}$, show that $\frac{dy}{dx} = \frac{y^2 \tan x}{y \log \cos x - 1}$ (3m)

SECTION - D

32. Check whether the relation R in $\mathbf{R}$ defined by $R = \{(a, b) : a \leq b^2\}$ is reflexive, symmetric or transitive. (5m)

33. a) If $y = (\sin x)^{x \cos x} + \sin^{-1} \sqrt{\sin x}$, then find $\frac{dy}{dx}$. (5m)

OR

b) If $x = a(\cos t + t \sin t)$ and $y = a(\sin t - t \cos t)$ then find $\frac{d^2y}{dx^2}$ (5m)

34. If $A^{-1} = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix}$ then find $(BA)^{-1}$. (5m)

35. a) Find: $\int \frac{x^2 + x + 1}{(x^2 + 1)(x + 2)} dx$ (5m)

OR

b) By using the properties of definite integrals, evaluate: $\int_0^{\pi/4} \log(1 + \tan x) dx$ (5m)

SECTION E - Case study-based questions

36. A carpenter needs to design a wooden box in the shape of a cuboid such that the sum of its length and breadth is 3cm more than its height. Twice of its length, thrice of its breadth and its height adds up to 10cm. Its breadth added to 7 times its height is 1cm less than 3 times its length.

On the basis of the above information, answer the following questions:

(i) Write the equations representing various dimensions algebraically and express them as a matrix equation form $AX = B$. (2m)

(ii) Find A^{-1} (2m)

37. During the festival season, there was a mela organized by the Resident Welfare Association at a park, near the society. The main attraction of the mela was a huge swing installed at one corner of the park. The swing is traced to follow the path of a parabola given by $x^2 = y$.

Based on the above information, answer the following questions:

(i) Let $f: \mathbb{N} \rightarrow \mathbb{R}$ is defined by $f(x) = x^2$. What will be the range?

(ii) Let $f: \mathbb{N} \rightarrow \mathbb{N}$ is defined by $f(x) = x^2$. Check if the function is injective or not.

(iii) (a) Let $f: \mathbb{R} \rightarrow \mathbb{R}$, defined as $f(x) = x^2 + x + 2$, check whether the function is injective and surjective or not.

OR

(b) Let $f: \mathbb{R} \rightarrow \mathbb{R}$ is defined by $f(x) = \frac{x}{\sqrt{1+x^2}}$. Determine whether f is one to one.

38. An online delivery company in Mumbai has 5000 subscribers and collects annual subscription fees of ₹ 300 per subscriber for unlimited free deliveries.

The company wishes to increase the annual subscription fee. It is predicted that, for every increase of Rs 1, ten subscribers will discontinue. Assume that the company increased the annual fee by Rs x .

Based on the given information, answer the following questions:

i) How many subscribers will discontinue after an increase of Rs x in annual fee?

ii) If $R(x)$ denotes the total revenue collected after the increase of Rs x in subscription fee, express $R(x)$ as function of x .

iii) (a) Find the value of x for which $R(x)$ is maximum.

OR

(b) Find the sub-intervals of $(0, 5000)$ in which $R(x)$ is increasing and decreasing
