



FACULTY HIGHER SECONDARY SCHOOL
CLASS – XII SCI
MATHEMATICS
SAMPLE PAPER– II
SESSION 19-20

MARKS : 50

Each Question Carries 1 mark:

1. Find the value of k if area of a triangle is 4 sq. units and its vertices are $(k, 0)$, $(4, 0)$, $(0, 2)$.
2. Is the function $f(x) = \frac{3x+4\tan x}{x}$ continuous at $x = 0$? If not, how may the function be defined to make it continuous at this point?
3. Show that the matrix $AB - BA$ is a skew symmetric if A and B both are symmetric matrix.
4. If $A = \begin{pmatrix} -2 & 3 \\ 1 & 1 \end{pmatrix}$ then find $|A^{-1}|$.

Each Question carries 1 mark :

Q. Choose the correct answer :

- (a) If A and B are square matrices of the same order then $(A - B)^2 = ?$
 - (i) $A^2 - 2AB + B^2$
 - (ii) $A^2 - AB - BA + B^2$
 - (iii) $A^2 - 2BA + B^2$
 - (iv) None of these.
- (b) If $y = \tan^{-1} \left(\frac{1 - \cos x}{\sin x} \right)$ then $\frac{dy}{dx} = ?$
 - (i) 1
 - (ii) -1
 - (iii) $\frac{1}{2}$
 - (iv) $-\frac{1}{2}$
- (c) $f(x) = \sin x$ is increasing in
 - (i) $\left(\frac{\pi}{2}, \pi \right)$
 - (ii) $\left(\pi, \frac{3\pi}{2} \right)$
 - (iii) $(0, \pi)$
 - (iv) $\left(-\frac{\pi}{2}, \frac{\pi}{2} \right)$
- (d) The normal to the curve $x^2 = 4y$ passing $(1, 2)$ is
 - (i) $x + y = 3$
 - (ii) $x - y = 3$
 - (iii) $x + y = 1$
 - (iv) $x - y = 1$
- (e) $\begin{vmatrix} \cos 70^\circ & \sin 20^\circ \\ \sin 70^\circ & \cos 20^\circ \end{vmatrix} = ?$
 - (i) 1
 - (ii) 0
 - (iii) $\cos 50^\circ$
 - (iv) $\sin 50^\circ$
- (f) If $l = m$, then the order of the matrix $7x - 5z$ is _____, where x and z are matrices of order $2 \times l$ and $2 \times m$ respectively.
 - (i) $m \times 2$
 - (ii) $2 \times l$
 - (iii) $l \times 3$
 - (iv) $m \times l$

Each Question carries 2 marks :

1. Solve : $\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$
2. Check whether the relation R in \mathbb{R} defined by $R = \{ (a, b) : a \leq b^3 \}$ is reflexive symmetric or transitive.
3. Find the matrix X so that

$$X \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix} = \begin{pmatrix} -7 & -8 & -9 \\ 2 & 4 & 6 \end{pmatrix}$$

4. If $A = \begin{pmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{pmatrix}$, then prove that $A^n = \begin{pmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{pmatrix}$, $n \in \mathbb{N}$
5. Differentiate $\sin^2 x$ w.r.t. $e^{\cos x}$
6. For what value of λ is the function defined by

$$f(x) = \begin{cases} \lambda(x^2 - 2x), & \text{if } x \leq 0 \\ 4x + 1, & \text{if } x > 0 \end{cases}$$

continuous at $x = 0$?

Each Question carries 4 marks :

1. If $(x - a)^2 + (y - b)^2 = c^2$ for some $c > 0$

Prove that $\frac{\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}}{\frac{d^2y}{dx^2}}$ is a constant independent of a and b .

2. Let $A = \mathbb{R} - \{2\}$ and $B = \mathbb{R} - \{1\}$. If $f : A \rightarrow B$ is a function defined by $f(x) = \frac{x-1}{x-2}$ then show that f is one-one and onto. Hence find f^{-1} .
3. Find the intervals in which the function f is given by $f(x) = 4x^3 - 6x^2 - 72x + 40$ is (a) strictly increasing (b) strictly decreasing.
4. If $A = \begin{pmatrix} 3 & -2 \\ 4 & -2 \end{pmatrix}$, find k so that $A^2 = KA - 2I_2$. Also find A^{-1} using elementary method.

Each Question carries 6 marks :

1. An Apache helicopter of enemy is flying of enemy along the curve given by $y = x^2 + 7$. A soldier placed at $(3, 7)$ wants to shoot down the helicopter when it is nearest to him. Find the nearest distanced.

OR

If $x = \frac{\sin 3t}{\sqrt{\cos 2t}}$, $y = \frac{\cos 3t}{\sqrt{\cos 2t}}$ prove that $\frac{dy}{dt} + \cos 3t = 0$

2. If $A = \begin{pmatrix} 2 & 3 & 10 \\ 4 & -6 & 5 \\ 6 & 9 & -20 \end{pmatrix}$, find A^{-1} , solve the system of equation

$$\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 2, \quad \frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 5 \text{ and } \frac{6}{x} + \frac{9}{y} - \frac{20}{z} = -4 \text{ using } A^{-1}.$$

OR

Using properties of determinants prove that

$$\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3.$$
