પુખ્ના International School
Shree Swaminarayan Gurukul, Zundal

HALF YEARLY (2020 - 21)					
Student's Name:		**Grade**	**XII**	**Roll No.**	
Date:	**09/09/2020 (Wednesday)**	**Time**	**3 hrs.**	**Subject**	**Maths**
Teacher's Sign.				**Total Marks**	**80**

General Instructions:

(i) All the questions are compulsory.

(ii) The question paper consists of 36 questions divided into 4 sections A, B, C, and D.

(iii) Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 6 questions of 4 marks each. Section D comprises of 4 questions of 6 marks each.

(iv) There is no overall choice. However, an internal choice has been provided in three questions of 1 mark each, two questions of 2 marks each, two questions of 4 marks each, and two questions of 6 marks each. You have to attempt only one of the alternatives in all such questions.

(v) Use of calculators is not permitted.

Section - A

Solve question 1 to 20 each carry 1 mark each

1) A relation f from C to R is defined by x f y $\Leftrightarrow$ IxI = y. Then, the correct option is

a) (2 + i)f 3 b) 3 f(-3) c) I f 1 d) (2 + 3i) f 13

2) If a relation R on the set {1,2,3} be defined by R = {(1,2)}, then R is

a) Reflexive b) transitive c) Symmetric d) None of these

3) The value of $\tan(\cos^{-1}3/5 + \tan^{-1}1/4)$ is

a) 19/8 b) 8/19 c) 19/12 d) ¾

4) If $\tan^{-1}2x + \tan^{-1}3x = \pi/4$, then x is equal to

a) 1 b)-1,1/10 c) 1/6 d) None of these

5) If A is a 3*2 matrix, B is a 3*3 matrix C is a 2*3 matrix, then the elements in A,B and C are respectively

a) 6,9,8 b) 6,9,6 c) 9,6,6 d) 6,6,9

6) Total number of possible matrices of order 3*3 with each entry 2 or 0 is

a) 9 b) 27 c) 81 d) 512

7) Minor of an element of a determinant of order n($n \geq 2$) is a determinant of order.

a) n b) n-1 c) n-2 d) n+1

8 A square matrix A is said to be non-singular, if

a) $|A| = 0$ b) $|A| \neq 0$ c) $|A| = -1$ d) $|A| = 1$

9) The function $f(x) = 4-x^2/4x-x^3$ is

a) Discontinuous at only one point b) Discontinuous at exactly two points

c) Discontinuous at exactly three points d) None of the above

10) The radius of the base of a cone is increasing at the rate of 3 cm/ min and the altitude is decreasing at the rate of 4 cm/min. The rate of change of lateral surface when the radius = 7 cm and altitude 24 cm, is

a) 54π cm^2 / min b) 7π cm^2 / min c) 27π cm^2 / min d) None of the above

11) If R is a relation 'is divisor of' from the set A= {1, 2, 3} to B= {4, 10, 15}, then write down the set of ordered pairs corresponding to R.

12) State the reason for relation R in the set {1, 2, 3} given by R={ (1,2), (2,1)} is not to be transitive.

13) Evaluate $\cot^{-1}(-\sqrt{3})$

14) Find the domain of the function $\cos^{-1}(2 x - 1)$

15) Let A= $[a_{ij}]_{nxn}$ be a diagonal matrix whose diagonal elements are different and B=$[b_{ij}]_{nxn}$ is some another matrix. If AB = $[c_{ij}]_{nxn}$, then find C_{ij}.

16) If A= $\begin{vmatrix} 1 & 2 \\ 3 & 4 \end{vmatrix}$, then find A + A'

17) If $\begin{vmatrix} 3x & 7 \\ 2 & 4 \end{vmatrix} = \begin{vmatrix} 8 & 7 \\ 6 & 4 \end{vmatrix}$, then find the value of x.

18) If the determinant of matrix A of order 3 x 3 is of value 4, then write the value of $|3A|$.

19) Find dy/dx, when 2x + 3y = sin y.

20) An edge of a variable cube is increasing at the rate of 3cm/s. How fast is the volume of the cube increasing, when the edge is 10 cm long?

Section - B

Solve question 21 to 28 each carry 2 marks each (any six) **[2X6 = 12]**

21. Construct a 3 x 4 matrix, whose elements are given by

$a_{ij} = \frac{1}{2}[- 3i + j]$

22. Find the value x, y and z from the following equation

$$\begin{bmatrix} 4 & 3 \\ x & 5 \end{bmatrix} = \begin{bmatrix} y & z \\ 1 & 5 \end{bmatrix}$$

23. Show that the relation R in the set { 1, 2, 3 } given by R = { (1, 2), (2, 1) } is symmetric but neither reflexive nor Transitive

24. Evaluate the determinant: $\begin{vmatrix} cos\theta & -sin\theta \\ sin\theta & cos\theta \end{vmatrix}$

25. If A = $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 4 \end{bmatrix}$, then show that |3 A| =27 |A |

26. Find the principal value of $\sin^{-1}\frac{1}{\sqrt{2}}$

27. Find the principal value of $\cot^{-1}\sqrt{3}$

28. Check the continuity of the function f given by f(x)= 2x+3 at x=1.

Section - C

Solve question 29 to 36 each carry 4 marks each (any six) **[4X6 = 24]**

29. Prove that $\begin{pmatrix} b+c & q+r & y+z \\ c+a & r+p & z+x \\ a+b & p+q & x+y \end{pmatrix} = 2\begin{pmatrix} a & p & x \\ b & q & y \\ c & r & z \end{pmatrix}$

30. Find gof andfog, if f(x) = 8x^3 and g(x) = $x^{\frac{1}{3}}$

31. Prove that $\begin{pmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{pmatrix}$ = 4 a b c

32. Find the inverse of the matrix

(i) $\begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}$ (ii) $\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$

33. If A = $\begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ then express the matrix as the sum of a symmetric and a skew symmetric matrix

34. Let R be the relation in the set { 1, 2, 3} given by R = {(1,2), (2,2), (1,1), (4,4), (1,3), (3,3) ,(3,20}. Choose the Correct answer.

(i) R is reflexive and symmetric but not transitive

(ii) R is reflexive and transitive but not symmetric

(iii) R is symmetric and transitive but not reflexive.

(iv) R is an equivalence relation.

35. Express $\tan^{-1}\left(\frac{\cos x}{1-\sin x}\right)$, $-\frac{\pi}{2} < x < \frac{3\pi}{2}$ in the simplest form.

OR

Solve $\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$

36. Find the equation of tangent to the curve given by $x = \sin^3 t$, $y = \cos^3 t$ at a point where $t = \frac{\pi}{2}$

OR

Differentiate $x^{x \sin x}$, $x > 0$ w r t x.

Section - D

Solve question 37 to 40 each carry 6 marks each **[6X4 = 24]**

37. Let: R ⟶ R be defined as $f(x)$ $10x + 7$. Find the function: R⟶ R such that $gof = fog = I_R$

38. Show that $\sin^{-1}\frac{3}{5} - \sin^{-1}\frac{8}{17} = \cos^{-1}\frac{84}{85}$

OR

Find minors and cofactors of the elements of the determinant $\begin{pmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{pmatrix}$ and verify that

$a_{11} A_{31} + a_{12} A_{32} + a_{13} A_{33} = 0$

39. Let A = $\begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$, B = $\begin{bmatrix} 5 & 2 \\ 7 & 4 \end{bmatrix}$, C = $\begin{bmatrix} 2 & 5 \\ 3 & 8 \end{bmatrix}$. Find a matrix D such that CD – AB = 0

OR

Find intervals in which the function given by $f(x) = \sin 3x$, $x \in \left[o, \frac{\pi}{2}\right]$ is

(i) Increasing (ii) decreasing.

40. Find $\frac{dy}{dx}$, if $y^x + x^y + x^x = a^b$

OR

Find $\frac{dy}{dx}$, $y = sinx^{sinx}$ for all $0 < x < \pi$.

ALL THE BEST