MATHEMATICS (041)

RELATIONS

1. Let $B = \{4,5,6\}\ and\ let\ R = \{(4,4),(5,5),(6,6),(4,5),(5,4),(5,6),(6,5)\}$. Then, R is			
Reflexive and symmetric but not transitive	symmetric and transitive but not reflexive	Reflexive and transitive but not symmetric	An equivalence relation
2. Let Z be the set of all integers and let R be a relation on Z defined by $\Leftrightarrow a - b\ is\ divisible\ by\ 7$. Then, R is			
Reflexive and symmetric but not transitive	symmetric and transitive but not reflexive	Reflexive and transitive but not symmetric	An equivalence relation
3. Let T be the set of all real numbers and let R be a relation on T, defined by $aRb \Leftrightarrow \lvert a-b\rvert \leq 2$. Then, R is			
Reflexive and symmetric but not transitive	symmetric and transitive but not reflexive	Reflexive and transitive but not symmetric	An equivalence relation
4. Let P be the set of all real numbers and let R be a relation on P, defined by $aRb \Leftrightarrow a^2 + b^2 = 1$. Then, R is			
Reflexive but neither symmetric nor not transitive	symmetric but neither transitive nor reflexive	transitive but neither symmetric nor reflexive	None of these
5. Let S be the set of all straight lines in a plane. Let R be a relation on S defined by $aRb \Leftrightarrow a \perp b$. Then, R is			
Reflexive but neither symmetric nor not transitive	symmetric but neither transitive nor reflexive	transitive but neither symmetric nor reflexive	An equivalence relation
6. Let S be the set of all triangles in a plane and let R be a relation on S defined by $\Delta_1 R \Delta_2 \Leftrightarrow \Delta_1 \cong \Delta_2$. Then, R is			
Reflexive and symmetric but not transitive	symmetric and transitive but not reflexive	Reflexive and transitive but not symmetric	An equivalence relation
7. Let R be a relation on NXN, defined by $(a,b)R(c,d) \Leftrightarrow a + d = b + c$. Then, R is			
Reflexive and symmetric but not transitive	symmetric and transitive but not reflexive	Reflexive and transitive but not symmetric	An equivalence relation
8. Let R be a relation on NXN, defined by $(a,b)R(c,d) \Leftrightarrow ad = bc$. Then, R is			
Reflexive and symmetric but not transitive	symmetric and transitive but not reflexive	Reflexive and transitive but not symmetric	An equivalence relation
9. Let $R = \{(x,x^3): x\ is\ a\ prime\ number\ less\ than\ 10\}$. Then, range of R is			
$\{8,27,125,343\}$	$\{1,2,3,5,7\}$	$\{2,3,5,7\}$	$\{1,8,27,125,343\}$

10. Let $R = \{(a,b): a,b \in N \; and \; a+3b = 12\}$. Then, domain of R is			
$\{1,2,3,4\}$	$\{3,6,9\}$	$\{1,2,3\}$	$\{0,3,6,9\}$
11. Let P be the set of all real numbers and let R be a relation on P, defined by $aRb \Leftrightarrow (1+ab) > 0$. Then R is			
Reflexive and symmetric but not transitive	symmetric and transitive but not reflexive	Reflexive and transitive but not symmetric	An equivalence relation
12. Let A = {1,2,3,5} and B = { 3,4,5}. Find the number of relations of A and B.			
12	4	3	2^{12}
13. Let $R_1 \; and \; R_2$ be two equivalence relations on a set A. Then $R_1 \cap R_2$ is			
An equivalence relation	Not an equivalence relation	Reflexive and symmetric but not transitive	symmetric and transitive but not reflexive

14. Mohan and his sister were playing a game .Mohan asked a question to her sister that:
Let $B = \{1,2,3,4,5,7,8\}$ and R is a relation in BXB, defined by
$(a,b)R(c,d) \Leftrightarrow a+d = b+c \; for \; all \; (a,b) \; and \; (c,d) \in AXA$. Then answer the following questions:
a) Is R reflexive
b) Is R symmetric
C) Is R transitive
d) If R is an equivalence relation then find the equivalence class of $(2,5)$

15. Two friends revising the chapter Relation before the examination. In the end they got doubt in one of the questions. The question is as follows:
Let $A = \{x \in Z: 0 \leq x \leq 12\}$ and R is a relation in AXA defined by $R = \{(a,b): |a - b| is \; a \; multiple \; of \; 4\}$. Then answer the following questions:
a) Is R reflexive
b) Is R symmetric
C) Is R transitive
d) If R is an equivalence relation then find the set of elements related to 1.

FUNCTIONS

1. The function f : A → B defined by f(x) = x + 7, x ∈ R is			
one-one	Many-one	Odd	Even
2. The function f(x) = [x] is a greatest integer function then the function is			
one-one	Many-one	Both (a) & (b)	None of these
3. The number of bijective functions from set A to itself when A contains 96 elements is			
96	$(96)^2$	96!	2^{96}
4. The function f : N → N defined by $f(x) = x^2 + x + 1$ is			
One-one and onto	One-one and into	Many-one and onto	Many-one and into
5. The function $f: R \to R: f(x) = cosx$ is			
One-one and onto	One-one and into	Many-one and onto	Many-one and into
6. The function $f: \left[\frac{-\pi}{2}, \frac{\pi}{2}\right] \to [-1,1]: f(x) = sinx$ is			

One-one and onto	One-one and into	Many-one and onto	Many-one and into
7. Let $A = R - \{4\}\ and\ B = R - \{1\}$. Then, $f: A \to B: f(x) = \frac{x-1}{x-4}$ is			
One-one and onto	One-one and into	Many-one and onto	Many-one and into
8. Let $f: R - \left\{\frac{-4}{3}\right\} \to R - \left\{\frac{4}{3}\right\}: f(x) = \frac{4x}{(3x+4)}$. Then, $f^{-1}(y) =$			
$\frac{4y}{(4-3y)}$	$\frac{4y}{(4y+3)}$	$\frac{4y}{(3y-4)}$	None of these
9. Let $f: N \to N: f(x) = 4x^2 + 12x + 15$. Then, $f^{-1}(y) =$			
$\frac{1}{2}\left(\sqrt{y-4}+3\right)$	$\frac{1}{2}\left(\sqrt{y-6}-3\right)$	$\frac{1}{2}\left(\sqrt{y-4}+5\right)$	None of these
10. Let A and B be two non-empty sets and let $f: (AXB) \to (BXA): f(a,b) = (b,a)$. Then, f is			
One-one and onto	One-one and into	Many-one and onto	Many-one and into
11. Let $f: C \to R: f(z) = \lvert z \rvert$ is			
One-one and onto	One-one and into	Many-one and onto	Many-one and into
12. Let $f: R \to R$ be defined by $f(x) = \begin{cases} 2x : x > 3 \\ x^2 : 1 \le x \le 3 \\ 3x : x \le 1 \end{cases}$. Then, $f(-1) + f(2) + f(4)$ is			
9	14	5	7
13. Set A has three elements and set B has four elements. The number of injection that can be defined from A to B is :			
144	12	24	64
14. Sita visited Disneyland along with her family. She was attracted by a huge swing which traced a path of a parabola as given by the equation $y = x^2$. Based on the information, give the answer of the following: a) Let $f: R \to R\ defined\ by\ f(x) = x^2$ is neither injective nor surjective. b) Let $f: N \to N\ defined\ by\ f(x) = x^2$ is injective but not surjective. c) Let $f: N \to R\ defined\ by\ f(x) = x^2$ then range of the function is. d) Let $f: Z \to Z\ defined\ by\ f(x) = x^2$ is neither injective nor surjective.			

INVERSE TRIGONOMETRIC FUNCTION

1. The principal value of $cos^{-1}\left(\frac{1}{2}\right)$			
$\frac{\pi}{3}$	$\frac{\pi}{6}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$
2.The principal value of $cos^{-1}\left(-\frac{1}{2}\right)$			
$\frac{-\pi}{3}$	$\frac{-\pi}{6}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$
3.The principal value of $sec^{-1}\left(-\frac{2}{\sqrt{3}}\right)$			

$\frac{\pi}{6}$	$\frac{-\pi}{6}$	$\frac{7\pi}{6}$	$\frac{5\pi}{6}$
4. Which of the following corresponds to the principal value branch of $tan^{-1}x$?			
$\left(\frac{-\pi}{2},\frac{\pi}{2}\right)$	$\left[\frac{-\pi}{2},\frac{\pi}{2}\right]$	$\left(\frac{-\pi}{2},\frac{\pi}{2}\right)-\{0\}$	$(0,\pi)$
5. Which of the following corresponds to the principal value branch of $cosec^{-1}x$?			
$\left(\frac{-\pi}{2},\frac{\pi}{2}\right)$	$\left[\frac{-\pi}{2},\frac{\pi}{2}\right]$	$\left[\frac{-\pi}{2},\frac{\pi}{2}\right]-\{0\}$	$[0,\pi]-\left\{\frac{\pi}{2}\right\}$
6. If $\tan^{-1}(\cot\theta) = 2\theta$, then θ is equal to			
π/3	π/4	π/6	None of these
7. Domain of $cos^{-1}[x]$, where $[.]$ denotes greatest integer function is			
$[-1,2)$	(-1,2)	[-1,2]	None of these
8. Range of $f(x) = sin^{-1}x + tan^{-1}x + sec^{-1}x$ is			
$\left(\frac{\pi}{4},\frac{3\pi}{4}\right)$	$\left[\frac{\pi}{4},\frac{3\pi}{4}\right]$	$\left\{\frac{\pi}{4},\frac{3\pi}{4}\right\}$	None of these
9. Domain of $sin^{-1}2x$ is			
$[0,1]$	$[-1,1]$	$\left[\frac{-1}{2},\frac{1}{2}\right]$	$[-2,2]$
10. The value of $sin\left[tan^{-1}(-\sqrt{3}) + cos^{-1}\left(\frac{-\sqrt{3}}{2}\right)\right]$ is			
1	-1	0	None of these
11. The value of $sin^2\left(cos^{-1}\frac{1}{2}\right) + cos^2\left(sin^{-1}\frac{1}{3}\right)$ is			
$\frac{17}{36}$	$\frac{59}{36}$	$\frac{36}{59}$	None of these
12. The value of $tan^{-1}1 + cos^{-1}\left(\frac{-1}{2}\right) + sin^{-1}\left(\frac{-1}{2}\right)$ is			
π	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{\pi}{2}$
13. The value of $sin\left(\frac{\pi}{3} - sin^{-1}\left(\frac{-1}{2}\right)\right)$ is			
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	1

Two persons standing at the point P and R on either side of a temple of 60 m high observes its top point Q at a certain angles of elevation. The distance between the two persons is 240m and the distance between the person P and the centre of the temple O is 60m.

Based on the above information, given solve the following questions :

a) Draw the figure of the given information

b) find OR and QR

c) Find QR

d) find the angles

MATRICES

1. A square matrix $A = [a_{ij}]_{n\times n}$ is called a diagonal matrix if $a_{ij} = 0$ for

$i = j$	$i < j$	$i > j$	$i \neq j$
2. If $A = [a_{ij}]_{2\times2}$, where $a_{ij} = \frac{(i+2j)^2}{2}$, then A is equal to			
$\begin{bmatrix} 9 & 25 \\ 8 & 18 \end{bmatrix}$	$\begin{bmatrix} 9 & \frac{25}{2} \\ 8 & 18 \end{bmatrix}$	$\begin{bmatrix} 9 & 25 \\ 4 & 9 \end{bmatrix}$	$\begin{bmatrix} 9 & \frac{15}{2} \\ 4 & 9 \end{bmatrix}$
3. If $2\begin{bmatrix} 3 & 4 \\ 5 & x \end{bmatrix} + \begin{bmatrix} 1 & y \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 7 & 0 \\ 10 & 5 \end{bmatrix}$ then			
$(x = -2, y = 8)$	$(x = 2, y = 8)$	$(x = 3, y = -6)$	$(x = -3, y = 6)$
4. If $A - 2B = \begin{bmatrix} 1 & -2 \\ 3 & 0 \end{bmatrix}$ and $2A - 3B = \begin{bmatrix} -2 & 2 \\ 3 & -3 \end{bmatrix}$ then B is			
$\begin{bmatrix} 6 & -4 \\ -3 & 3 \end{bmatrix}$	$\begin{bmatrix} -4 & 6 \\ -3 & -3 \end{bmatrix}$	$\begin{bmatrix} 4 & -6 \\ 3 & -3 \end{bmatrix}$	$\begin{bmatrix} -6 & -4 \\ 3 & 3 \end{bmatrix}$
5. If $A + B = \begin{bmatrix} 4 & -3 \\ 1 & 6 \end{bmatrix}$ and $A - B = \begin{bmatrix} -2 & -1 \\ 5 & 2 \end{bmatrix}$ then AB is			
$\begin{bmatrix} -7 & 5 \\ 1 & -5 \end{bmatrix}$	$\begin{bmatrix} 7 & -5 \\ 1 & 5 \end{bmatrix}$	$\begin{bmatrix} 7 & -1 \\ 5 & -5 \end{bmatrix}$	$\begin{bmatrix} 7 & -1 \\ -5 & 5 \end{bmatrix}$
6. If A and B are square matrices of the same order then $(A + B)^2$ is			
$A^2 + 2AB + B^2$	$A^2 + AB + BA + B^2$	$A^2 + 2BA + B^2$	None of these
7. If A and B are square matrices of the same order then $(A + B)(A - B)$ is			
$A^2 - B^2$	$A^2 + AB - BA - B^2$	$A^2 - AB + BA - B^2$	None of these
8. If $A = \begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix}$ and $f(x) = 2x^2 - 4x + 5$ then $f(A)$ is			
$\begin{bmatrix} 19 & -32 \\ -16 & 51 \end{bmatrix}$	$\begin{bmatrix} 19 & -16 \\ -32 & 51 \end{bmatrix}$	$\begin{bmatrix} 19 & -11 \\ -27 & 51 \end{bmatrix}$	$\begin{bmatrix} -19 & 11 \\ -16 & 51 \end{bmatrix}$
9. If A is a square matrix then $A + A^{/}$ is			
A null matrix	An identity matrix	A symmetric matrix	A skew – symmetric matrix
10. If A is a square matrix then $A - A^{/}$ is			
A null matrix	An identity matrix	A symmetric matrix	A skew – symmetric matrix
11. Two matrices of same order are said to be equal if the ……. of the two matrices are equal			
Corresponding elements	Diagonal elements	Only non – diagonal elements	None of these
12. Total number of possible matrices of order 4x4 with each entry 2 or 3 is			
16	6	2^{16}	None of these
13.Horizontally arranged elements in a matrix are called			
columns	rows	transpose	None of these
14. Which one of the following is a scalar matrix?			
$\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$	$\begin{bmatrix} 6 & 0 \\ 0 & 3 \end{bmatrix}$	$\begin{bmatrix} -8 & 0 \\ 0 & -8 \end{bmatrix}$	$\begin{bmatrix} 0 & -8 \\ 8 & 0 \end{bmatrix}$

Two farmers Ramakishan and Gurucharan Singh cultivated only three varieties of rice namely Basmati, Permal and Naura. The sale (in rupees) of these varieties of rice by both the farmers in the month of September and October are given by the following matrices A and B.

September sales (in rupees)

$$A = \begin{bmatrix} 10{,}000 & 20{,}000 & 30{,}000 \\ 50{,}000 & 30{,}000 & 10{,}000 \end{bmatrix} \begin{matrix} Ramakishan \\ Gurucharan \end{matrix}$$

October sale (in rupees)

$$B = \begin{bmatrix} 5{,}000 & 10{,}000 & 6{,}000 \\ 20{,}000 & 10{,}000 & 10{,}000 \end{bmatrix} \begin{matrix} Ramakishan \\ Gurucharan \end{matrix}$$

Based on the information , give the answer of the following questions:

a) The total sales in September and October for each farmer in each variety can be represented by …..

b) What is the value of A_{23}?

c) The decrease in sales from September to October is given by …..

d) If Ramakishan receives 2% profit on gross sales, compute his profit for each variety sold in October.

e) If Gurucharan receives 2% profit on gross sales, compute his profit for each variety sold in September.

DETERMINANTS

1. If $A = \begin{bmatrix} 1 & k & 3 \\ 3 & k & -2 \\ 2 & 3 & -4 \end{bmatrix}$ is singular then k is			
$\frac{16}{3}$	$\frac{34}{5}$	$\frac{33}{2}$	$\frac{16}{5}$
2. If A is a 3x3 matrix and $\|A\| = 4, then\ adj(adjA)$ is			
4A	16A	64A	32A
3. If A is a 3x3 matrix and $\|A\| = 5, then\ \|adjA\|$ is			
5	25	125	625
4. If A and B are invertible matrices of the same order then $(AB)^{-1}$ is			
$A^{-1} \times B^{-1}$	$B^{-1} \times A^{-1}$	$A \times B^{-1}$	$A^{-1} \times B$
5. If A and B are two non zero square matrices of the same order such that AB = 0 , then			
$\|A\| = 0\ or\ \|B\| = 0$	$\|A\| = 0\ and\ \|B\| = 0$	$\|A\| \neq 0\ and\ \|B\| \neq 0$	None of these
6. If A is a 3- rowed square matrix and $\|3A\| = k\|A\|$, then k is			
3	9	27	1
7. If $\begin{bmatrix} x & 2 \\ 18 & x \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 18 & 6 \end{bmatrix}$, then x is equal to			
6	± 6	-6	0
8. If $A = \begin{bmatrix} a & 4 \\ 4 & a \end{bmatrix}\ and\ \|A^3\| = 729$, then the value of 'a' is			
± 6	± 3	± 4	± 5
9. If A is an orthogonal matrix, then			
$detA = \pm 1$	$detA = 0$	$detA = -2$	None of these
10. If the points $(a, b+c), (b, c+a)\ and\ (x, a+b)$ are collinear , then the value of x is			
a	b	c	-a
11. If A is a 3 X 3 non – singular matrix, then $\|A^{-1}adjA\|$ is			
$\|A\|$	1	$\|A\|^2$	$\|A\|^{-1}$
12. If A and B are invertible matrices, then which of the following is not correct?			
$adjA = \|A\|A^{-1}$	$det(A)^{-1} = [det(A)]^{-1}$	$(AB)^{-1} = B^{-1}A^{-1}$	$(A+B)^{-1} = B^{-1} + A^{-1}$
13. If A is a square matrix such that $A^2 = A$, then $\|A\|$ is equal to			

0 or 1	-2 or 2	-3 or 3	None of these

14. Isika wants to donate a rectangular plot of land. When she was asked to give dimensions of plot, she told that the area of the rectangle gets reduced by 9 sq. units., if its length is reduced by 5 units and breadth is increased by 3 units, but if increase the length by 3 units and breadth by 2 units, the area increase by 67sq. units. Based on the information given above , answer the following questions a) Find the equations in x and y where is the length and y is the breadth of the plot. b) Using matrix method, find the length and breadth of the plot. c) How much is the perimeter of the plot? d) How much is the area of the rectangle?

Class-XII

Continuity and Differentiability

Choose the correct answers from the given four options in each of the following:

1. If $f(x) = 2x$ and $g(x) = \frac{x^2}{2} + 1$, then which of the following can be a discontinuous function

   (a) $f(x) + g(x)$ (b) $f(x) - g(x)$

   (c) $f(x) \cdot g(x)$ (d) $\frac{g(x)}{f(x)}$

2. The function $f(x) = \frac{4 - x^2}{4x - x^3}$ is

   (a) discontinuous at only one point
   (b) discontinuous at exactly two points
   (c) discontinuous at exactly three points
   (d) none of these

3. The set of points where the function f given by $f(x) = |2x - 1| \sin x$ is differentiable is

   (a) R (b) $R - \left\{\frac{1}{2}\right\}$ (c) $(0, \infty)$ (d) none of these

4. The function $f(x) = \cot x$ is discontinuous on the set

   (A) $\{x = n\pi : n \in \mathbf{Z}\}$ (B) $\{x = 2n\pi : n \in \mathbf{Z}\}$

   (C) $\left\{x = (2n+1)\frac{\pi}{2} ; n \in \mathbf{Z}\right\}$ (iv) $\left\{x = \frac{n\pi}{2} ; n \in \mathbf{Z}\right\}$

5. The function $f(x) = e^{|x|}$ is

   (A) continuous everywhere but not differentiable at $x = 0$
   (B) continuous and differentiable everywhere
   (C) not continuous at $x = 0$
   (D) none of these.

6. If $f(x) = x^2 \sin\frac{1}{x}$, , where $x \neq 0$, then the value of the function f at $x = 0$, so that the function is continuous at $x = 0$, is

   (a) 0 (b) –1 (c) 1 (d) none of these

7. If $f(x) = \begin{cases} mx + 1, & \text{if } x \leq \frac{\pi}{2} \\ \sin x + n, & \text{if } x > \frac{\pi}{2} \end{cases}$, is continuous at $x = \frac{\pi}{2}$, then

   (a) $m = 1, n = 0$ (b) $m = \frac{n\pi}{2} + 1$ (c) $n = \frac{m\pi}{2}$ (d) $m = n = \frac{\pi}{2}$

8. Let $f(x) = |\sin x|$. Then
(a) f is everywhere differentiable
(b) f is everywhere continuous but not differentiable at $x = n\pi, n \in Z$.
(c) f is everywhere continuous but not differentiable at $x = (2n+1)\frac{\pi}{2}, n \in Z$.
(d) none of these

9. If $y = \log\left(\frac{1-x^2}{1+x^2}\right)$, then $\frac{dy}{dx}$ is equal to

(A) $\frac{4x^3}{1-x^4}$ (B) $\frac{-4x}{1-x^4}$

(C) $\frac{1}{4-x^4}$ (D) $\frac{-4x^3}{1-x^4}$

10. If $y = \sqrt{\sin x + y}$, then $\frac{dy}{dx}$ is equal to

(A) $\frac{\cos x}{2y-1}$ (B) $\frac{\cos x}{1-2y}$

(C) $\frac{\sin x}{1-2y}$ (D) $\frac{\sin x}{2y-1}$

11. The derivative of $\cos^{-1}(2x^2 - 1)$ w.r.t. $\cos^{-1} x$ is

a) 2 (b) $\frac{-1}{2\sqrt{1-x^2}}$ (c) $\frac{2}{x}$ (d) $1-x^2$

12. If $x = t^2, y = t^3$, then $\frac{d^2y}{dx^2}$ is

(a) $\frac{3}{2}$ (b) $\frac{3}{4t}$ (c) $\frac{3}{2t}$ (d) $\frac{3}{2t}$

Case Study based questions (13-16)

A potter made a mud vessel, where the shape of the pot is based on f(x) = |x-3| + |x-2|, where f(x) represents height of the pot.

Based on the given information, answer the following questions:(13-16)

13. When x>4 what will be the height in terms of x?
    a) x-2 b) x-3 c) 2x-5 d) 5-2x
14. The value of dy/dx at x=3 :
    a) 2 b) -2 c) Function is not differentiable d) 1
15. When the value of x lies between (2,3)then the function is:
    a) 2x-5 b)5-2x c)1 d)5
16. What is the value of derivative of f(x) =[x] at the point x=8?
    a. 1 b. f(x) is not differentiable at x=8 c. 0 d. none of these
17. The number of points at which the function $f(x) = \frac{1}{\log|x|}$ is discontinuous is
    A) 1 B)2 C) 3 D) None of these
18. If $f(x) = |\cos x|$, find $f'\left(\frac{3\pi}{4}\right)$.
    A) $^1/_{\sqrt{2}}$ B) $^1/_2$ C) $^{-1}/_{\sqrt{2}}$ D) $-^1/_2$
19. If $y = \log\left[e^x\left(\frac{x-1}{x+2}\right)^{1/2}\right]$, then $\frac{dy}{dx}$ is equal to
    (a) 7 (b) $\frac{3}{x-2}$
    (c) $\frac{3}{(x-1)}$ (d) None of these
20. The derivative of $\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$ with respect to $\cot^{-1}\left(\frac{1-3x^2}{3x-x^3}\right)$ is
    (a) 1 (b) $\frac{3}{2}$
    (c) $\frac{2}{3}$ (d) $\frac{1}{2}$
21. F(x)=$\frac{1}{1-x}$ then points of discontinuity of f(f(x))
    A) 0 &1 B) 1&2 C) 2 & -1 D) -2 &-1
22. If $f(x) = \begin{cases} \frac{x^3+x^2-16x+20}{(x-2)^2}, & x \neq 2 \\ k, & x=2 \end{cases}$ is continuous at $x = 2$, the value of k.
    A) 5 B)6 C) 7 D)8
23. If $y = \frac{\ell n x}{x}$, then the value of $y''(e)$ is
    (a) 1 (b) $-\frac{1}{e}$
    (c) $-\frac{1}{e^2}$ (d) $-\frac{1}{e^3}$

24. If $x = a(\cos\theta + \theta\sin\theta)$, $y = a(\sin\theta - \theta\cos\theta)$, then $\frac{d^2y}{dx^2} =$

(a) $\frac{\sec^3\theta}{a\theta}$ (b) $\frac{\sec^2\theta}{\theta}$

(c) $a\theta\cos^3\theta$ (d) $\frac{\sec^2\theta}{a}$

25. If $y^2 = ax^2 + bx + c$, then $\frac{d}{dx}\left(y^3 y_z\right) =$

(a) 1 (b) -1

(c) $\frac{4ac - b^2}{a^2}$ (d) 0

26. If $f(x) = \sqrt{1+\cos^2(x^2)}$, then the value of $f'\left(\frac{\sqrt{\pi}}{2}\right)$ is

(a) $\frac{\sqrt{\pi}}{6}$ (b) $-\sqrt{\frac{\pi}{6}}$

(c) $\frac{1}{\sqrt{6}}$ (d) $\frac{\pi}{\sqrt{6}}$

27. If $y = \tan^{-1}\left[\frac{\sin x + \cos x}{\cos x - \sin x}\right]$, then $\frac{dy}{dx}$ is equal to

(a) $\frac{1}{2}$ (b) $\frac{\pi}{4}$

(c) 0 (d) 1

28. If $f(x) = \tan^{-1}\left(\sqrt{\frac{1+\sin x}{1-\sin x}}\right), 0 \le x < \frac{\pi}{2}$, then $f'\left(\frac{\pi}{6}\right)$ is

(a) $-\frac{1}{4}$ (b) $-\frac{1}{2}$

(c) $\frac{1}{4}$ (d) $\frac{1}{2}$

29. If $y = e^{\frac{1}{2}\log(1+\tan^2 x)}$, then $\frac{dy}{dx}$ is equal to

(a) $\frac{1}{2}\sec^2 x$ (b) $\sec^2 x$

(c) $\sec x \tan x$ (d) $e^{\frac{1}{2}\log(1+\tan^2 x)}$

30. If $y = e^{3x+7}$, then the value of $\left.\frac{dy}{dx}\right|_{x=0}$ is

(a) 1 (b) 0

(c) -1 (d) $3e^7$

31. If $y = \cos^2\left(\frac{3x}{2}\right) - \sin^2\left(\frac{3x}{2}\right)$, then $\frac{d^2y}{dx^2}$ is

(a) $-3\sqrt{1-y^2}$ (b) $9y$

(c) $-9y$ (d) $3\sqrt{1-y^2}$

32. Let $f(x)=\frac{1n(1+ax)-1n(1-bx)}{x}, x\neq 0$. If f(x) is continuous at x = 0, then f(0) =

(a) a – b (b) a + b

(c) b – a (d) ln a + ln b

33. If $f(x)=\begin{cases}\frac{1-\cos 4x}{x^2}, & x<0\\ a, & x=0\\ \frac{\sqrt{x}}{\sqrt{16+\sqrt{x}}-4}, & x>0\end{cases}$ is continuous at x = 0, then a =

(a) 4 (b) 6

(c) 8 (d) none of these

34. Let $f(x)=\frac{1-\tan x}{4x-\pi}, x\neq\frac{\pi}{4}, x\in\left(0,\frac{\pi}{2}\right)$.

If f(x) is continuous in $\left(0,\frac{\pi}{2}\right)$, then $f\left(\frac{\pi}{4}\right)$ =

(a) 1 (b) $\frac{1}{2}$

(c) $-\frac{1}{2}$ (d) -1

35. If $f(x)=\frac{\sqrt{4+x}-2}{x}, x\neq 0$ be continuous at x = 0, then f(0) =

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$

(c) 2 (d) $\frac{3}{2}$

36. If $x\sqrt{1+y}+y\sqrt{1+x}=0$, then $\frac{dy}{dx}$ =

(a) $\frac{x+1}{x}$ (b) $\frac{1}{1+x}$

(c) $\frac{-1}{(1+x)^2}$ (d) $\frac{x}{1+x}$

37. If $f(x)=-\sqrt{25-x^2}$, then $\lim_{x\to 1}\frac{f(x)-f(1)}{x-1}$ is equal to

(a) $\frac{1}{24}$ (b) $\frac{1}{5}$

(c) $-\sqrt{24}$ (d) $\frac{1}{\sqrt{24}}$

38. If $f(x)=(\log_{\cot x}\tan x)(\log_{\tan x}\cot x)^{-1}+\tan^{-1}\frac{4x}{4-x^2}$, then $f'(2)$ is equal to

(a) $\frac{1}{2}$ (b) $-\frac{1}{2}$

(c) 1 (d) -1

39. **If $x^m y^n = (x+y)^{m+n}$, then $\frac{dy}{dx}$ is equal to**

(a) $\frac{x+y}{xy}$ (b) xy

(c) $\frac{x}{y}$ (d) $\frac{y}{x}$

40. **If $y = e^{x+e^{x+e^{x+\ldots \text{ to } \infty}}}$, find $\frac{dy}{dx}$ =**

(a) $\frac{y^2}{1-y}$ (b) $\frac{y^2}{y-1}$

(c) $\frac{y}{1-y}$ (d) $\frac{-y}{1-y}$