MATHEMATICS | **12th CLASS – 1st Annual 2024** | **TIME: 30 MINUTES**
GROUP : FIRST | **OBJECTIVE** | **MARKS: 20**

NOTE: You have four choices for each objective type question as A , B , C and D . The choice which you think is correct , fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question.

QUESTION NO. 1

1 Derivative of $\sqrt{x}$ w.r.t. x at x = a is
(A) $\sqrt{a}$ (B) $2\sqrt{a}$ (C) $\frac{1}{\sqrt{a}}$ (D) $\frac{1}{2\sqrt{a}}$ ●

2 If $f(x) = x^{100}$, $f'(1) =$
(A) 0 (B) 50 (C) 99 (D) 100 ●

3 $\int a^{\lambda x}\, dx =$
(A) $\frac{a^{\lambda x}}{\lambda} + c$ (B) $\frac{a^{\lambda x}}{\ln a} + c$ (C) ● $\frac{a^{\lambda x}}{\lambda \ln a} + c$ (D) $a^{\lambda x} \cdot \ln a + c$

4 $\int e^x \left(\frac{1}{x} - \frac{1}{x^2}\right) dx =$
(A) ● $\frac{e^x}{x} + c$ (B) $-\frac{e^x}{x} + c$ (C) $e^x \cdot \ln x + c$ (D) $-\frac{e^x}{x^2} + c$

5 $\int \frac{1}{x^2 + 16}\, dx =$
(A) $\tan^{-1}\left(\frac{x}{4}\right) + c$ (B) ● $\frac{1}{4}\tan^{-1}\left(\frac{x}{4}\right) + c$ (C) $\frac{1}{4}\tan\left(\frac{x}{4}\right) + c$ (D) $\frac{1}{2}\tan^{-1}\left(\frac{x}{4}\right) + c$

6 $\int 0\, dx =$
(A) ● 0 (B) 1 (C) x + c (D) constant

7 A line which pass through one vertex and mid-point of opposite side of a triangle is called
(A) Median ● (B) Altitude (C) Normal (D) Perpendicular bisector

8 If A(- 2 , 3) , B(- 4 , 1) and C(3 , 5) are the vertices of a triangle , then its centroied is
(A) $\left(\frac{-3}{2}, \frac{9}{2}\right)$ (B) (- 1 , 3) ● (C) (- 3 , 4) (D) (- 3 , 9)

9 If point (2 , - 9) lies on line px + y + 20 = 0 , then value of p is
(A) $\frac{11}{2}$ (B) $\frac{-11}{2}$ ● (C) $\frac{29}{2}$ (D) $\frac{-29}{2}$

10 If x > b , then which one is correct ?
(A) - x > - b (B) - x < b (C) x < b (D) - x < - b ●

11 The circle whose radius is 0 is called a/an
(A) Unit circle (B) Imaginary circle (C) Point circle ● (D) Circum circle

12 The point (- 5 , 6) lies ..... the circle $x^2 + y^2 = 61$
(A) Outside (B) Inside (C) On ● (D) Any where

13 The length of semi-latus rectum of hyperbola
(A) 2a (B) $\frac{b^2}{2a}$ (C) $\frac{b^2}{a}$ (D) $\frac{2b^2}{a}$ ●

14 Which of the following is not vector quantity
(A) Weight ● (B) Momentum (C) Force (D) Energy

15 If vectors $\vec{a}$ and $\vec{b}$ have same direction , then $\vec{a} \cdot \vec{b} =$
(A) ab ● (B) - ab (C) $ab \sin\theta$ (D) $(ab)^2$

16 Value of $2\hat{i} \times 2\hat{j} \cdot \hat{k}$ is
(A) 0 (B) 1 (C) 2 ● (D) 4

17 cosec hx is equal to .....
(A) $\frac{2}{e^x + e^{-x}}$ (B) $\frac{1}{e^x + e^{-x}}$ (C) $\frac{2}{e^x - e^{-x}}$ ● (D) $\frac{2}{e^{-x} - e^x}$

18 f(x) = ax + b , $a \neq 0$ is a/an
(A) Linear function ● (B) Odd function (C) Even function (D) Identity function

19 Derivative of an identity function is
(A) 0 (B) 1 (C) – 1 ● (D) Identity function

20 $x^3 \frac{d}{dx}(\ln 2x) =$
(A) x^2 ● (B) $2x^3$ (C) $3x^2$ (D) $6x^2$

SECTION-I

QUESTION NO. 2 Write short answers any Eight (8) of the following 16

i	Express perimeter 'p' of a square as a function of its area 'A'
ii	Without finding inverse state domain and range of f^{-1} if $f(x) = (x-5)^2$, $x \geq 5$
iii	Evaluate $\lim_{x \to 1} \frac{x^2-1}{x^2-x}$
iv	Evaluate the limit $\lim_{\theta \to 0} \frac{\sin^2\theta}{\theta}$
v	Differentiate with respect to 'x' $\frac{1}{x-a}$ by definition
vi	Differentiate with respect to 'x' $\frac{a+x}{a-x}$
vii	Find $\frac{dy}{dx}$ by making suitable substitution of $y = (3x^2 - 2x + 7)^6$
viii	Differentiate with respect to 'x' $\frac{1}{a} \sin^{-1}\left(\frac{a}{x}\right)$
ix	Differentiate $(ln\, x)^x$ with respect to 'x'
x	Find y_2 if $x^2 + y^2 = a^2$
xi	Show that $\cos(x+h) = \cos x - h \sin x - \frac{h^2}{2!}\cos x + \frac{h^3}{3!}\sin x + \ldots\ldots\ldots$
xii	Find interval in which 'f' is increasing or decreasing $f(x) = \cos x$, $x \in \left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$

QUESTION NO. 3 Write short answers any Eight (8) of the following 16

i	Find δy and dy of $y = x^2 - 1$, when x changes from 3 to 3.02
ii	Evaluate $\int \frac{(\sqrt{\theta}-1)^2}{\sqrt{\theta}}\, d\theta$
iii	Find the area between the x-axis and the curve $y = 4x - x^2$
iv	Solve the differential equation $\frac{dy}{dx} = \frac{y}{x^2}$, $(y > 0)$
v	Evaluate $\int_{-1}^{3} (x^3 + 3x^2)\, dx$
vi	Evaluate $\int x\, ln\, x\, dx$
vii	Find $\int \frac{-2x}{\sqrt{4-x^2}}\, dx$
viii	Find distance between the points A(-8 , 3) ; B(2 , -1). Also find mid-point between them
ix	The coordinates of a point p are (- 6 , 9). The axes are translated through the point O′ (-3 , 2). Find the coordinates of P referred to the new axes
x	Show that points (- 4 , 6) ; (3 , 8) and (10 , 10) lie on the same line
xi	Find the distance from the point P(6 , -1) to the line $6x - 4y + 9 = 0$
xii	Find measure of the angle between the lines represented by $x^2 - xy - 6y^2 = 0$

QUESTION NO. 4 Write short answers any Nine (9) of the following 18

i	Graph the inequality $x + 3y > 6$
ii	Define feasible region and feasible solution
iii	Find the centre and radius of circle $x^2 + y^2 - 6x + 4y + 13 = 0$
iv	Find the slope of normal to the circle $x^2 + y^2 = 25$ at (4 , 3)
v	Check the position of the point (5 , 6) w.r.t circle $x^2 + y^2 = 81$
vi	Find the focus and directrix of parabola $x^2 = -16y$
vii	Find centre and foci of ellipse $25x^2 + 9y^2 = 225$
viii	Find eccentricity and vertices of $x^2 - y^2 = 9$
ix	Find a vector whose magnitude is 2 and is parallel to $-\underline{i} + \underline{j} + \underline{k}$
x	Find cosine of the angle between $\underline{u}$ and $\underline{v}$ where $\underline{u} = [-3, 5]$ and $\underline{v} = [6, -2]$
xi	Compute $\underline{a} \times \underline{b}$ and $\underline{b} \times \underline{a}$ if $\underline{a} = \underline{i} + \underline{j}$ and $\underline{b} = \underline{i} - \underline{j}$
xii	If $\underline{a} + \underline{b} + \underline{c} = 0$ then prove that $\underline{a} \times \underline{b} = \underline{b} \times \underline{c}$
xiii	Find the volume of the parallelepiped determined by $\underline{u} = \underline{i} + 2\underline{j} - \underline{k}$, $\underline{v} = \underline{i} - 2\underline{j} + 3\underline{k}$ and $\underline{w} = \underline{i} - 7\underline{j} - 4\underline{k}$

(P.T.O)

DG Khan Board-2024

SECTION-II

ote: Attempt any Three questions from this section **10 x 3 = 30**

Q.5- (A)	Discuss continuity of f at x = 3 , when $f(x) = \begin{cases} x-1 & if\ x<3 \\ 2x+1 & if\ x \geq 3 \end{cases}$
(B)	Prove that $y\frac{dy}{dx} + x = 0$ if $x = \frac{1-t^2}{1+t^2}$, $y = \frac{2t}{1+t^2}$
Q.6- (A)	If $y = (\cos^{-1} x)^2$, prove that $(1-x^2)y_2 - xy_1 - 2 = 0$
(B)	Evaluate : $\int \sqrt{4-5x^2}\ dx$
Q.7-(A)	Evaluate $\int_0^{\pi/4} \frac{\cos\theta + \sin\theta}{2\cos^2\theta}\ d\theta$
(B)	Maximize $f(x , y) = x + 3y$ subject to the constraints $2x + 5y \leq 30$; $5x + 4y \leq 20$; $x \geq 0$; $y \geq 0$
Q.8-(A)	Find equations of the tangents drawn from (0 , 5) to $x^2 + y^2 = 16$
(B)	Prove that $\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$ using vectors
Q.9-(A)	Find centre , foci , eccentricity and directrices of hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$
(B)	Find equation of line through the intersection of $x - y - 4 = 0$ and $7x + y + 20 = 0$ and perpendicular to the line $6x + y - 14 = 0$

MATHEMATICS
GROUP : SECOND

PAPER CODE - 8196
12th CLASS – 1st Annual 2024
OBJECTIVE

TIME: 30 MINUTES
MARKS: 20

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QUESTION NO. 1

1 $\int e^x(\sin x - \cos x)\,dx = ?$
(A) $e^x \cos x + c$ (B) $e^x \sin x + c$ (C) $-e^x \cos x + c$ (D) $-e^x \sin x + c$

2 $\int_0^{1/2} \frac{1}{\sqrt{1-x^2}}\,dx = ?$
(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

3 The distance of a point P(2 , - 3) from the x – axis is equal to
(A) - 3 (B) - 2 (C) 2 (D) 3

4 If (2 , 4) , (4 , 6) and (3 , 2) are the vertices of a triangle , then coordinates of the centroid are
(A) (3 , 4) (B) (4 , 6) (C) $\left(\frac{9}{2}, 6\right)$ (D) (24 , 48)

5 The lines represented by $3x^2 - 5xy - 3y^2 = 0$ will be
(A) Parallel (B) Perpendicular (C) Neither parallel nor perpendicular (D) Tangent lines

6 $x = 2$ is the solution of
(A) $x > 1$ (B) $x < 5$ (C) $x > 7$ (D) $x > 9$

7 A chord which contains the centre of the circle is called
(A) Radius (B) Focal chord (C) Diameter (D) Tangent line

8 The perpendicular at the outer end of a radial segment is ..... to the circle
(A) Secant (B) Normal (C) Perpendicular (D) Tangent

9 Asymptotes of the curve $\frac{x^2}{16} - \frac{y^2}{25} = 1$ are
(A) $y = \pm \frac{5}{4}x$ (B) $y = \pm \frac{4}{5}x$ (C) $y = \frac{5}{4}\sqrt{x^2 - 16}$ (D) $y = -\frac{5}{4}\sqrt{x^2 - 16}$

10 Projection of a vector $\vec{b}$ along vector $\vec{a}$ is
(A) $\frac{\vec{a}.\vec{b}}{|\vec{b}|}$ (B) $\frac{\vec{a}.\vec{b}}{\vec{b}}$ (C) $\frac{\vec{a}.\vec{b}}{\vec{a}}$ (D) $\frac{\vec{a}.\vec{b}}{|\vec{a}|}$

11 The value of $[\hat{k}\ \hat{\imath}\ \hat{\jmath}] = ?$
(A) - 1 (B) 0 (C) 1 (D) 2

12 If three vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ are coplanar , then scalar triple product of these vectors is
(A) a negative number (B) a positive number (C) a non-negative number (D) zero

13 $\lim_{x \to a} \frac{x^{n-1} - a^{n-1}}{x - a} = ?$
(A) na^{n-1} (B) $(n-1)a^{n-2}$ (C) na^{n-1} (D) $(n-1)a^{n-1}$

14 If $f(x) = 2 + \sqrt{x-1}\ \forall\ x \in \mathbb{R}$, then domain of $f^{-1}(x)$ is
(A) [-1 , + ∞) (B) [0 , + ∞) (C) [1 , + ∞) (D) [2 , + ∞)

15 $\frac{d}{dx}\left(x - \frac{\sin 2x}{2}\right) = ?$
(A) $2\sin^2 x$ (B) $2\cos^2 x$ (C) $2\sin x$ (D) $2\cos x$

16 If $f(x) = \frac{1}{12}x^4$, then $f^{(4)}(x) = ?$
(A) 0 (B) 1 (C) 2 (D) 3

17 If $xy + y^2 = 2$, then $\frac{dy}{dx} = ?$
(A) $\frac{-x}{x+2y}$ (B) $\frac{-y}{x+2y}$ (C) $\frac{xy-y}{x+2y}$ (D) $\frac{x-2y}{x-y}$

18 If $f(x) = x^2 + 2x - 3$, then $f(x)$ is decreasing in the interval
(A) (-1 , + ∞) (B) (- ∞ , - 1) (C) (- ∞ , 1) (D) (1 , 3)

19 $\int \frac{\sin x - \cos x}{\sqrt{1 - \sin 2x}}\,dx = ?$
(A) $x + c$ (B) $\sin x + c$ (C) $\cos x + c$ (D) $\cos^2 x + c$

20 $\int \frac{x}{x+2}\,dx = ?$
(A) $x + ln(x+2) + c$ (B) $x - ln(x+2)^2 + c$ (C) $x - ln(x+2) + c$ (D) $x + ln(x+2)^2 + c$

SECTION-I

 16

QUESTION NO. 2 Write short answers any Eight (8) of the following

i	Express the perimeter P of a square as a function of its area A
ii	Find the values of (fog) and (gof) when $f(x) = 2x + 1$, $g(x) = \frac{3}{x-1}$
iii	Evaluate $\lim\limits_{x \to -1} \frac{x^3 - x}{x+1}$
iv	Find c such that $\lim\limits_{x \to -1} f(x)$ exist where $f(x) = \begin{cases} x+2 & , x \leq -1 \\ c+2 & , x > -1 \end{cases}$
v	Find $\frac{dy}{dx}$ by definition when $y = 2x^2 + 1$
vi	Find $\frac{dy}{dx}$ when $y = \frac{2x-3}{2x+1}$
vii	If $x = \theta + \frac{1}{\theta}$ and $y = \theta + 1$, find $\frac{dy}{dx}$
viii	Differentiate $\sin x$ w.r.t. $\cot x$
ix	If $y = x\, e^{\sin x}$, find $\frac{dy}{dx}$
x	Find y_2 when $x = at^2$, $y = bt^4$
xi	Find the extreme values of $f(x) = 3x^2$
xii	Find y_2 when $y = 2x^5 - 3x^4 + 4x^3 + x - 2$

QUESTION NO. 3 Write short answers any Eight (8) of the following 16

i	Use differentials to find $\frac{dy}{dx}$ and $\frac{dx}{dy}$ of $x^4 + y^2 = xy^2$
ii	Evaluate $\int \frac{(1-\sqrt{x})^2}{\sqrt{x}}\, dx$
iii	Evaluate $\int \frac{dx}{x^2 + 4x + 13}$
iv	Evaluate $\int x^2 \tan^{-1} x\, dx$
v	Evaluate $\int \frac{(a-b)x}{(x-a)(x-b)}\, dx$
vi	Evaluate $\int_1^2 \frac{x^2+1}{x+1}\, dx$
vii	Solve the differential equation $\frac{dy}{dx} = \frac{1-x}{y}$
viii	Show that points A(-1 , 2) , B(7 , 5) and C(2 , - 6) are vertices of right triangle
ix	In a triangle A(8 , 6) , B(- 4 , 2) , C(- 2 , - 6) find slope of any one median of triangle
x	Find the slopes of lines l_1 and l_2 where l_1 : Joining (2 , 7) and (7 , 10) l_2 : Joining (1 , 1) and (-5 , 3)
xi	Find the lines represented by $3x^2 + 7xy + 2y^2 = 0$
xii	Find the distance between parallel lines $2x + y + 2 = 0$, $6x + 3y - 8 = 0$

QUESTION NO. 4 Write short answers any Nine (9) of the following 18

i	Indicate the solution set of the system of linear inequalities $3x + 7y \geq 21$, $x - y \leq 2$
ii	Define feasible region
iii	Find centre and radius of the circle $4x^2 + 4y^2 - 8x + 12y - 25 = 0$
iv	Find vertex and directrix of parabola $(x - 1)^2 = 8(y + 2)$
v	Define axis of parabola
vi	Find an equation of hyperbola with foci $(0 , \pm 6)$ and $e = 2$
vii	Find centre and vertices of ellipse $25x^2 + 9y^2 = 225$
viii	Find equation of tangent to the conic $y^2 = 4ax$ at point (x_1 , y_1)
ix	Find direction cosines of the vector $6\hat{i} - 2\hat{j} + \hat{k}$
x	If the vectors $\underline{u} = \alpha\underline{i} + 2\alpha\underline{j} - \underline{k}$ and $\underline{v} = \underline{i} + \alpha\underline{j} + 3\underline{k}$ are perpendicular. Find the value of α
xi	Define unit vector. Also give an example
xii	Find the value of α for which $\alpha\hat{i} + \hat{j}$, $\hat{i} + \hat{j} + 3\hat{k}$ and $2\hat{i} + \hat{j} - 2\hat{k}$ are coplanar
xiii	Define cross product of two vectors $\underline{u}$ and $\underline{v}$

(P.T.O)

SECTION-II

Note: Attempt any Three questions from this section **10 x 3 = 30**

Q.5- (A)	Prove that $\lim_{x \to 0} \frac{a^x - 1}{x} = \log_e a$
(B)	If $x = a\cos^3\theta$, $y = b\sin^3\theta$, show that $a\frac{dy}{dx} + b\tan\theta = 0$
Q.6- (A)	If $y = e^x \sin x$, show that $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$
(B)	Evaluate : $\int \sqrt{a^2 + x^2}\ dx$
Q.7-(A)	Evaluate $\int_0^1 \frac{3x}{\sqrt{4-3x}}\ dx$
(B)	Maximize $f(x, y) = x + 3y$ subject to constraints $2x + 5y \leq 30$ $5x + 4y \leq 20$; $x, y \geq 0$
Q.8-(A)	Show that the circles $x^2 + y^2 + 2x - 2y - 7 = 0$ and $x^2 + y^2 - 6x + 4y + 9 = 0$ touches externally
(B)	Use vector method to prove that $\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$
Q.9-(A)	Find an equation of the ellipse with given data centre (0 , 0) , focus (0 , - 3) , vertex (0 , 4)
(B)	If two vertices of an equilateral triangle are A(- 3 , 0) and B(3 , 0). Find the third vertex. How many of these triangles are possible ?

PAPER CODE - 8195

12th CLASS – 1st Annual 2023

MATHEMATICS **TIME: 30 MINUTES**

GROUP : FIRST **OBJECTIVE** **MARKS: 20**

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QUESTION NO. 1

1 $\int e^{-x}(\cos x - \sin x)dx =$ ....

(A) $-e^{-x}\sin x + c$ (B) $e^{-x}\sin x + c$ (C) $e^{x}\cos x$ (D) $-e^{x}\cos x + c$

2 The order of differential equation $x^2\frac{d^2y}{dx^2} + \frac{dy}{dx} + 2x = 0$ is

(A) 1 (B) 2 (C) 3 (D) 4

3 Vertical line passes through (5,4) is

(A) $y = 4$ (B) $x = 5$ (C) $y = 5$ (D) $y = -4$

4 Slope of line perpendicular to $3x - 4y + 5 = 0$ is

(A) $-4/3$ (B) $-3/4$ (C) $3/4$ (D) $4/3$

5 Coordinate of mid-point of A $(-1, 4)$ and B$(6, 2)$ is ....

(A) $(-7, 2)$ B $(7, -2)$ (C) $\left(5/2, 3\right)$ (D) $\left(5/2, -5/2\right)$

6 Graph of $4y \geq 5$ will be .... half plane

(A) lower (B) right (C) upper (D) left

7 Directrix of $y^2 = 8x$ is

(A) $x + 2 = 0$ (B) $x - 2 = 0$ (C) $y + 2 = 0$ (D) $y - 2 = 0$

8 Vertices of the ellipse $\frac{x^2}{16} + \frac{y^2}{25} = 1$ are ....

(A) $(0, \pm 4)$ (B) $(\pm 4, 0)$ (C) $(\pm 5, 0)$ (D) $(0, \pm 5)$

9 The center of circle $x^2 + y^2 - 6x + 4y + 13 = 0$ is

(A) $(3, -2)$ (B) $(-3, 2)$ (C) $(-3, -2)$ (D) $(3, 2)$

10 An angle in the semi-circle is of measure .....

(A) 30^o (B) 90^o (C) 45^o (D) 60^o

11 $\left[\underline{k}\ \underline{i}\ \underline{j}\right] =$ ....

(A) 1 (B) -1 (C) 0 (D) 3

12 If $\underline{U} = \underline{i} + \propto\underline{j} - \underline{k}$ and $\underline{V} = 2\underline{i} + \underline{j} + \underline{k}$ are perpendicular then $\propto =$ ....

(A) 1 (B) 2 (C) -1 (D) 0

13 $f(x) = x \quad \forall x \in \times$ is called ....

(A) Constant function (B) Identity function (C) Non – linear function (D) Trigonometric function

14 $\lim_{x\to 0}(1-x)^{1/x} =$ ....

(A) e^x (B) ∞ (C) $e^{\frac{1}{x}}$ (D) e^{-1}

15 $\frac{d}{dx}(\tan x) =$ .....

(A) $\ln\cos x$ (B) $-\ln\cos x$ (C) $\sec^2 x$ (D) $-\sec^2 x$

16 If $f(x) = \sin x$ then $f'\left(\frac{\pi}{2}\right) =$ .....

(A) 0 (B) 1 (C) 2 (D) -1

17 $\frac{d}{dx}(\cosh 2x) =$ ....

(A) $\cosh 2x$ (B) $2\cosh 2x$ (C) $2\sinh 2x$ (D) $\sinh 2x$

18 For a stationary point of function we have $f'(x) =$ ....

(A) 0 (B) Positive (C) Negative (D) ∞

19 If $v = x^3$ then differential of v is

(A) $3x^2$ (B) $3x^2dv$ (C) x^3dx (D) $3x^2dx$

20 $\int \frac{\sec^2 x}{\tan x}dx =$ ....

(A) $\tan x + c$ (B) $-\cot x + c$ (C) $\ln(\tan x) + c$ (D) $\sec x + c$

QUESTION NO. 2 Write short answers any Eight (8) of the following 16

i	Express the area A of a circle as a function of its circumference C.
ii	For any real valued function of $f(x) = 2x + 1$, find $fof(x)$.
iii	Evaluate $lim_{\theta \to 0} \frac{1-\cos\theta}{\sin\theta}$
iv	Differentiate $(x - 5)(3 - x)$ w.r.t x
v	Find $\frac{dy}{dx}$ if $xy + y^2 = 2$
vi	Find $\frac{dy}{dx}$ if $y = x \cos y$
vii	Find $f'(x)$ if $f(x) = e^x(1 + \ln x)$
viii	Find y_2 if $x^2 + y^2 = a^2$
ix	Apply Maclaurin series expansion to prove that $\cos x = 1 - \frac{x^2}{\lfloor 2} + \frac{x^4}{\lfloor 4} - \frac{x^6}{\lfloor 6} + \ldots\ldots\ldots$
x	Find the extreme values for the function $f(x) = 5x^2 - 6x + 2$
xi	Define convex region.
xii	Graph the solution set of the inequality $5x - 4y \leq 20$

QUESTION NO. 3 Write short answers any Eight (8) of the following 16

i	Evaluate $\int \frac{dx}{\sqrt{x+1}-\sqrt{x}}$
ii	Evaluate $\int \frac{adt}{2\sqrt{at+b}}$
iii	Find $\int x \ln x \, dx$
iv	Evaluate the definite integral $\int_{-6}^{2} \sqrt{3 - x}\, dx$
v	Evaluate $\int \frac{2x}{x^2-a^2} dx$, $x > a$
vi	Evaluate $\int (x + 1)(x - 3) dx$
vii	Evaluate $\int \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) dx$, $x > 0$
viii	Define equal Vectors.
ix	Find the unit vector in the direction of the vector $\underline{v} = 2\underline{i} + 6\underline{j}$
x	Let $\bar{A} = (2,5)$, $B(-1,1)$ Find $\overline{AB}$
xi	Write two properties of Dot Product.
xii	Define cross product of two vectors and give its geometrical meanings.

QUESTION NO. 4 Write short answers any Nine (9) of the following 18

i	The points *A (-5,-2)* and *B(5,-4)* are ends of diameter of Circle, Find the Center and radius of Circle.
ii	The coordinates of P are (- 6 , 9) , the axes are translated through point $O'(-3,2)$, Find coordinate of P referred to new axes.
iii	By means of slopes, show that *(4,-5)* , *(7,5)* and *(10, 15)* lie on same line.
iv	Find equation of line whose x-intercept is -3, y-intercept is 4.
v	Convert $15y - 8x + 3 = 0$ into normal and slope intercept form.
vi	Check whether the lines $4x - 3y - 8 = 0$, $3x - 4y - 6 = 0$ and $x - y - 2 = 0$ are concurrent.
vii	Find lines represented by $6x^2 - 19xy + 15y^2 = 0$
viii	Find centre and radius of circle $5x^2 + 5y^2 + 24x + 36y + 10 = 0$
ix	Find equation of circle with centre $(\sqrt{2}, -3\sqrt{3})$ and radius $2\sqrt{2}$
x	Write equation of tangent to $3x^2 + 3y^2 + 5x - 13y + 2 = 0$ at $\left(1, \frac{10}{3}\right)$
xi	Find focus and vertex of parabola $y^2 = -8(x - 3)$
xii	Find equation of ellipse having centre (0 , 0) , focus at (0 , - 3) and one vertex at (0 , 4)
xiii	Find eccentricity and vertices of hyperbola $\frac{x^2}{4} - \frac{y^2}{9} = 1$

SECTION-II

Note: Attempt any Three questions from this section **10 x 3 = 30**

Q.5- (A)	Find the values m and n, so that the given function is continuous at $x = 3$ $f(x) = \begin{cases} mx & if \quad x < 3 \\ n & if \quad x = 3 \\ -2x + 9 & if \quad x > 3 \end{cases}$
(B)	If $y = \sqrt{x} - \frac{1}{\sqrt{x}}$ show that $2x \frac{dy}{dx} + y = 2\sqrt{x}$
Q.6- (A)	Evaluate the idefinite integral $\int \sqrt{x^2 - a^2}\, dx$
(B)	Find the equation of the medians of triangle whose vertices are *A(-3,2), B(5,4)* and *C(3,-8)*
Q.7-(A)	Evaluate $\int_o^{\pi/4} (1 + cos^2\theta)\, tan^2\theta\, d\theta$
(B)	Maximize $f(x, y) = x + 3y$, subject to the constraints $2x + 5y \leq 30$ $5x + 4y \leq 20$ $x \geq 0 \quad , \quad y \geq 0$
Q.8-(A)	Find $f'(x)$ *if* $f(x) = \sqrt{ln(e^{2x} + e^{-2x})}$
(B)	Write an equation of the circle that passes through the points $A(4,5), B(-4,-3), C(8,-3)$
Q.9-(A)	Find the focus, vertex and directrex of the parabola $x + 8 - y^2 + 2y = 0$
(B)	Prove that angle in a semi circles is a right angle.

PAPER CODE - 8194

MATHEMATICS | **12th CLASS – 1st Annual 2023** | **TIME: 30 MINUTES**

GROUP : SECOND | **OBJECTIVE** | **MARKS: 20**

NOTE: You have four choices for each objective type question as A , B , C and D . The choice which you think is correct , fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

QUESTION NO. 1

1 $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] =$

(A) $\frac{f(x)g'(x)-f'(x)g(x)}{[g(x)]^2}$ (B) $\frac{f'(x)g(x)-g'(x)f(x)}{[f(x)]^2}$ (C) $\frac{g(x)f'(x)-f(x)g'(x)}{[g(x)]^2}$ (D) $\frac{g'(x)f'(x)-f(x)g(x)}{[g(x)]^2}$

2 $\frac{1}{1+x^2}$ is derivation of

(A) $sin^{-1}x$ (B) $sec^{-1}x$ (C) $tan^{-1}x$ (D) $cot^{-1}x$

3 $\int ln\,x\,dx$ is equal to

(A) $x\text{-}x\,lnx + c$ (B) $x\,lnx + x + c$ (C) $\frac{1}{x}\,ln\,x + c$ (D) $x\,ln - x + c$

4 $\int_1^2 (x^2+1)\,dx =$

(A) $\frac{3}{10}$ (B) 2 (C) $\frac{10}{3}$ (D) 0

5 $\int a^x\,dx =$

(A) $\frac{a^x}{\ln a}+c$ (B) $\frac{\ln a}{a^x}+c$ (C) $\frac{1}{a^x lna}+c$ (D) $a^x lna + c$

6 The solution of differential equation $\frac{dy}{dx} = -y$ is

(A) $y = x\,e^{-x}$ (B) $y = c\,e^{-x}$ (C) $y = e^x$ (D) $y = c\,e^x$

7 The distance between the points (0, 0) and (1, 2) is

(A) 0 (B) 1 (C) 2 (D) $\sqrt{5}$

8 A linear equation in two variables represents

(A) circle (B) ellipse (C) hyperbola (D) straight line

9 The slope- intercept form of equation of line is

(A) $y = \frac{1}{m}x - c$ (B) $y = mx+c$ (C) $y = cx+m$ (D) $y = cx\text{-}m$

10 Bisectors of angles of a triangle are

(A) Parallel (B) Perpendicular (C) Concurrent (D) Non-concurrent

11 The feasible solution which maximizes or minimizes the objective function is called

(A) Exact solution (B) Final solution (C) Optimal solution (D) Objective solution

12 Equation of circle with centre at origin and radius $\sqrt{5}$ is

(A) $x^2 + y^2 = \sqrt{5}$ (B) $x^2 + y^2 = 5$ (C) $x^2 + y^2 = 25$ (D) $(x-3)^2 + y^2 = 5$

13 The parabola $y^2 = 4ax$, $a > 0$ opens

(A) Right (B) Left (C) Upward (D) Downward

14 In an ellipse, the foci lie on

(A) Major axis (B) Minor axis (C) Directin (D) Z – axis

15 If $\bar{F} = 4\,\underline{i} + 3\,\underline{j} + 5\,\underline{k}$ and $\bar{d} = -\,\underline{i} + 3\,\underline{j} + 8\,\underline{k}$, then work done is

(A) 30 unit (B) 45 unit (C) 53 unit (D) 47 unit

16 If $\underline{U}$, $\underline{V}$ and $\underline{W}$ are coterminous edges of a tetrahedron, then its volume is

(A) $[\underline{U}\ \underline{V}\ \underline{W}]$ (B) $\frac{1}{3}[\underline{U}\ \underline{V}\ \underline{W}]$ (C) $\frac{1}{6}[\underline{U}\ \underline{V}\ \underline{W}]$ (D) $\frac{1}{9}[\underline{U}\ \underline{V}\ \underline{W}]$

17 If $f(x) = x^2$, then range of f is

(A) All non-negative real numbers (B) Rational numbers (C) Integers (D) Irrational numbers

18 $\lim_{\theta\to 0}\frac{sin\,7\theta}{\theta} =$

(A) 7 (B) $\frac{1}{7}$ (C) 1 (D) $\frac{2}{7}$

19 $\frac{d}{dx}(x^{an}) = 0$

(A) $-\,anx^{an-1}$ (B)) anx^{an-1} (C) $(an\text{-}1)x^{an-1}$ (D) $\frac{x^{an+1}}{an+1}$

20 If $y = \frac{1}{x^2}$, then $\frac{dy}{dx}$ at $x = -1$ is

(A) 2 (B) 3 (C) $\frac{1}{3}$ (D) 4

MATHEMATICS
GROUP : SECOND

12th CLASS – 1st Annual 2023
SUBJECTIVE
SECTION-I

TIME : 2.30 HOURS
MARKS : 80

QUESTION NO. 2 Write short answers any Eight (8) of the following 16

i	Prove the identity $sech^2x = 1 - tanh^2x$
ii	Evalaute $\lim_{x\to\infty}\left(\frac{x}{1+x}\right)^x$
iii	If $f(x) = \begin{cases} x+2, & x \le -1 \\ c+2, & x > -1 \end{cases}$, Find C so that $\lim_{x\to -1} f(x)$ exists
iv	Differentiate w.r.t 'x' $\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2$
v	Find $\frac{dy}{dx}$, if $x = \theta + \frac{1}{\theta}$ and $y = \theta + 1$
vi	Differentiate w.r.t 'x' $\cos\sqrt{x} + \sqrt{\sin x}$
vii	Find $f'(x)$ if $f(x) = \frac{e^x}{e^{-x}+1}$
viii	Find y_2 if $x = at^2$, $y = bt^4$
ix	Apply Maclaurin series expansion to prove $e^{2x} = 1 + 2x + \frac{4x^2}{2!} + \frac{8x^3}{3!} + \ldots\ldots\ldots\ldots$
x	Find two positive integers whose sum is 30 and their product will be miximum.
xi	Graph the solution region of linear inequality $3x - 2y \ge 6$
xii	Graph the linear inequality $2x \ge -3$ in $xy-$ plane.

QUESTION NO. 3 Write short answers any Eight (8) of the following 16

i	Find $\int x\cos x\,dx$
ii	Evaluate $\int x^2 \tan^{-1} x\,dx$
iii	Evaluate $\int_0^{\frac{\pi}{3}} \cos^2\theta \sin\theta\, d\theta$
iv	Evaluate $\int_1^e x \ln x\,dx$
v	Find area between the x-axis and the curve $y = 4x - x^2$
vi	Solve $\frac{dy}{dx} = \frac{y^2+1}{e^{-x}}$
vii	Solve the differential equation $\sec x + \tan y \frac{dy}{dx} = 0$
viii	If $\overrightarrow{AB} = \overrightarrow{CD}$. Find coordinates of the point A when points B, C, D are (1, 2), (-2, 5), (4, 11) respectively.
ix	Prove $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$
x	Find a vector whose magnitude is 4 and is parallel to $2\underline{i} - 3\underline{j} + 6\underline{k}$
xi	Show that the components of $\underline{a}$ vector are projections of that vectors along $\underline{i}$, $\underline{j}$ and $\underline{k}$ respectively.
xii	Show that the vectors $3\underline{i} - 2\underline{j} + \underline{k}$, $\underline{i} - 3\underline{j} + 5\underline{k}$ and $2\underline{i} - \underline{j} - 4\underline{k}$ from a right angle triangle.

QUESTION NO. 4 Write short answers any Nine (9) of the following 18

i	Show that for the points $A(3,1)$, $B(-2,-3)$ and $C(2,2)$, $\lvert\overline{AB}\rvert = \lvert\overline{BC}\rvert$
ii	Find the point that divide the join of $A(-6,3)$ and $B(5,-2)$ in the ratio 2 : 3 internally.
iii	Find the slope and inclination of line joining the points $(4,6)$; $(4,8)$
iv	Find an equation of line with x-intercept : -9 and slope : -4
v	Find the area of triangle whose vertices are A (2 , 3) , $B(-1,1)$ and C (4, -5)
vi	Find the lines represented by the equation $2x^2 + 3xy - 5y^2 = 0$
vii	Find an equation of the line through $(11, -5)$ and parallel to a line with slope -24
viii	Find an equation of circle with centre $(-3, 5)$ and radius 7
ix	Find centre and radius of circle $x^2 + y^2 - 6x + 4y + 13 = 0$
x	Check the position of the point $(5, 6)$ w.r.t circle $x^2 + y^2 = 81$
xi	Find an equation of parabola with focus $(-3, 1)$ and directrix $x = 3$
xii	Find centre and foci of the ellipse $x^2 + 4y^2 = 16$
xiii	Find foci and vertices of hyperbola $\frac{y^2}{4} - x^2 = 1$

(P.T.O)

SECTION-II

Note: Attempt any Three questions from this section **10 x 3 = 30**

Q.5- (A)	Find the values m and n so that the given function $f(x)$ is continuous at $x = 3$ $f(x) = \begin{cases} mx & if \quad x < 3 \\ n & if \quad x = 3 \\ -2x + 9 & if \quad x > 3 \end{cases}$
(B)	If $y = \sqrt{x} - \frac{1}{\sqrt{x}}$ show that $2x \frac{dy}{dx} + y = 2\sqrt{x}$
Q.6- (A)	Evaluate $\int e^{2x} \cos 3x \, dx$
(B)	Find an equation of the line through (5 , - 8) and perpendicular to the join of A(-15, -8) , B(10,7)
Q.7-(A)	Find the area between the x-axis and the curve $y = \sqrt{2ax - x^2}$, where $a > 0$
(B)	Maximize $f(x,y) = x + 3y$ subject to the constraints $2x + 5y \leq 30$; $5x + 4y \leq 20$; $x \geq 0$; $y \geq 0$
Q.8-(A)	Find y_4 if $y = \cos^3 x$
(B)	Find equation of circle passing through A (3, −1) , B (0 ,1) and having centre at 4x−3y−3= 0
Q.9-(A)	Find the centre, foci eccentricity, vertices and equation of directrices of $\frac{(x-1)^2}{2} - \frac{(y-1)^2}{9} = 1$
(B)	Prove that $C = a \cos B + b \cos A$.

PAPER CODE - 8191

MATHEMATICS | **12th CLASS – 12022** | **TIME: 30 MINUTES**

GROUP : FIRST | **OBJECTIVE** | **MARKS: 20**

NOTE: You have four choices for each objective type question as A , B , C and D . The choice which you think is correct , fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

QUESTION NO. 1

1 $\lim_{x \to +\infty} \frac{2-3x}{\sqrt{3+4x^2}}$ = ...

(A) 3/2 (B) -3/2 (C) $+\infty$ (D) $-\infty$

2 If $f(x) = \begin{cases} x+2 & x \le -1 \\ c+2 & x > -1 \end{cases}$ and $\lim_{x \to -1} f(x)$ exists then c = ...

(A) -2 (B) 2 (C) 1 (D) -1

3 $\frac{d}{dx} \sin h^{-1} x$ = ...

(A) $\frac{1}{\sqrt{1+x^2}}$ (B) $\frac{-1}{\sqrt{1+x^2}}$ (C) $\frac{1}{\sqrt{1-x^2}}$ (D) $\frac{-1}{\sqrt{1-x^2}}$

4 Any point where function f is neither increasing nor decreasing provided $f'(x) = 0$ is called

(A) Critical point (B) Point of inflection (C) Stationary point (D) Feasible point

5 $\frac{d}{dx} \cos(ax + b)$ = ...

(A) sin (ax + b) (B) – a sin (ax + b) (C) a sin (ax + b) (D) – sin (ax + b)

6 $\frac{d}{dx} e^{3x}$ = ...

(A) $\frac{1}{3} e^{3x}$ (B) e^{3x} (C) $3 e^{3x}$ (D) $3 e^{3x} \ln 3$

7 $\int_{-\pi}^{\pi} \sin x \, dx$ = ...

(A) -1 (B) 0 (C) 1 (D) cos x

8 $\int \frac{e^x}{e^x+3} dx$ = ...

(A) $e^x + 3 + c$ (B) $e^x + c$ (C) $e^x \ln(e^x + 3) + c$ (D) $\ln(e^x + 3) + c$

9 $\int \frac{x}{\sqrt{4+x^2}} dx$ = ...

(A) $\sqrt{4+x^2} + c$ (B) $\frac{1}{2}\sqrt{4+x^2}$ (C) $\frac{1}{(x+4)^{3/2}} + c$ (D) $\ln\left|\sqrt{4+x^2}\right| + c$

10 Solution of differential equation $\frac{dy}{dx} = -y$ is

(A) $y = -ce^x$ (B) $y = ce^x$ (C) $y = ce^{-x}$ (D) $y = e^x$

11 The distance between the points A (3 , 1) , B (-2 , - 4)

(A) $2\sqrt{5}$ (B) $5\sqrt{2}$ (C) $\sqrt{5}$ (D) $\sqrt{2}$

12 The point of intersection of the lines $3x + y + 12 = 0$ and $x + 2y - 1 = 0$ is

(A) (5 , 3) (B) (-5 , - 3) (C) (5 , - 3) (D) (-5 , 3)

13 Slope of the line $2x + 5y - 8 = 0$ is

(A) -2/5 (B) 2/5 (C) 5/2 (D) -5/2

14 The y-intercept of the equation of line $5x - 12y + 39 = 0$

(A) $\frac{5}{12}$ (B) $\frac{-39}{12}$ (C) $\frac{39}{12}$ (D) $\frac{-5}{12}$

15 Graph of the inequality $x + 2y < 6$ lies .....

(A) Opposite to origin (B) Toward origin (C) in 1st quadrant (D) in 2nd quadrant

16 Radius of the circle with equation $x^2 + y^2 + 2gx + 2fy + c = 0$ is

(A) $\sqrt{g^2 + f^2 + c}$ (B) $\sqrt{g^2 - f^2 - c}$ (C) $\sqrt{g^2 + f^2 - c^2}$ (D) $\sqrt{g^2 + f^2 - c}$

17 The line through the focus and perpendicular to the directrix of parabola is called

(A) tangent to parabola (B) axis of parabola (C) latusrectum of parabola (D) vertex of parabola

18 $x = a\cos\theta$, $y = b\sin\theta$ are parametric equations of .....

(A) Circle (B) Parabola (C) Ellipse (D) Hyperbola

19 If $\underline{u}$ and $\underline{v}$ be two vectors making an angle θ with each other then projection of $\underline{u}$ along $\underline{v}$ is

(A) $\frac{\underline{u} \cdot \underline{v}}{|\underline{v}|}$ (B) $\frac{\underline{u} \cdot \underline{v}}{|\underline{u}|}$ (C) $\frac{\underline{u} \times \underline{v}}{|\underline{v}|}$ (D) $\frac{\underline{u} \times \underline{v}}{|\underline{u}|}$

20 $3\underline{j} \cdot \underline{k} \times \underline{i}$ = ...

(A) 0 (B) - 3 (C) $\underline{j}$ (D) 3

QUESTION NO. 2 Write short answers any Eight (8) of the following 16

i	Prove the identity $\sec h^2 x = 1 - \tan h^2 x$
ii	If $f(x) = 2x + 1$ and $g(x) = x^2 - 1$. The obtain the expression $fg(x)$
iii	Obtain $f^{-1}(x)$ from $f(x) = -2x + 8$
iv	Evaluate $\lim_{x \to 0} \frac{\sin x^\circ}{x}$
v	If $f(x) = \begin{cases} x+2, & x \leq -1 \\ c+2, & x > -1 \end{cases}$, find " c " so that $\lim_{x \to -1} f(x)$ exists
vi	If $y = \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2$, then find $\frac{dy}{dx}$
vii	Differentiate $x^2 - \frac{1}{x^2}$ w.r.t. " x^4 "
viii	If $y = x^2 \sec 4x$, then find $\frac{dy}{dx}$
ix	Obtain $f'(x)$ from $f(x) = x^3 . e^{1/x}$
x	Find $\frac{dy}{dx}$ if $y = x\, e^{\sin x}$
xi	Determine the interval in which $f(x) = 4 - x^2$, $x \in (-2, 2)$ is increasing
xii	Examine the function $f(x) = x^2 - x - 2$ for critical values

QUESTION NO. 3 Write short answers any Eight (8) of the following 16

i	Use differentials to find $\frac{dy}{dx}$ if $xy + x = 4$
ii	Find $\int \frac{dx}{\sqrt{x+1} - \sqrt{x}}$
iii	Find $\int x . \sqrt{x^2 - 1}\, dx$
iv	Find $\int \frac{x^2}{x^2+4}\, dx$
v	Find $\int \tan^{-1} x\, dx$
vi	Find $\int e^{-x} (\cos x - \sin x)\, dx$
vii	$\int_{-6}^{2} \sqrt{3 - x}\, dx$
viii	Solve the differential equation $\frac{dy}{dx} = \frac{y}{x^2}$
ix	Find the equation of a vertical line through (-5 , 3)
x	Convert the equation $2x - 4y + 11 = 0$ (i) Two intercepts form (ii) Normal form
xi	Check whether the point (5 , 8) lies below or above the line $2x - 3y + 6 = 0$
xii	Find the lines represented by $3x^2 + 7xy + 2y^2 = 0$

QUESTION NO. 4 Write short answers any Nine (9) of the following 18

i	Graph the solution set of $3x - 2y \geq 6$
ii	Graph the solution set of the following linear inequality $3x + 7y \geq 21$, $y \leq 4$
iii	If $\underline{v} = \frac{-\sqrt{3}}{2}\underline{i} - \frac{1}{2}\underline{j}$. then find a unit vector in the direction of $\underline{v}$
iv	If $\underline{u} = 2\underline{i} + 3\underline{j} + \underline{k}$, $\underline{v} = 4\underline{i} + 6\underline{j} + 2\underline{k}$ and $\underline{w} = -6\underline{i} - 9\underline{j} - 3\underline{k}$ then find $\underline{u} + 2\underline{v}$
v	If $\underline{a} = 2\underline{i} - 2\underline{j} + 4\underline{k}$, $\underline{b} = -\underline{i} + \underline{j} - 2\underline{k}$ then find a unit vector perpendicular to plane containing $\underline{a}$ and $\underline{b}$
vi	If $\underline{u} = \underline{i} + 2\underline{j} - \underline{k}$, $\underline{v} = \underline{i} - 2\underline{j} + 3\underline{k}$ and $\underline{w} = \underline{i} - 7\underline{j} - 4\underline{k}$. Then find volume of parallelepiped by these vectors
vii	Find work done , if the point at which the constant force $\underline{F} = 4\underline{i} + 3\underline{j} + 5\underline{k}$ is applied to an object moves from $P_1(3, 1, -2)$ to $P_2(2, 4, 6)$
viii	Write equation of normal to the circle $x^2 + y^2 = 25$ at $(5 \cos\theta , 5 \sin\theta)$
ix	Find focus of the parabola $x^2 - 4x - 8y + 4 = 0$
x	Find eccentricity and vertices of the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$
xi	Define circle and write equation of circle in standard form
xii	Find equation of the parabola with focus (2 , 5) and directrix $y = 1$
xiii	Find centre and foci of the hyperbola $\frac{y^2}{4} - x^2 = 1$

(P.T.O)

SECTION-II

Note: Attempt any Three questions from this section **10 x 3 = 30**

Q.5- (A)	If $x = \frac{1-t^2}{1+t^2}$, $y = \frac{2t}{1+t^2}$, then show $y\frac{dy}{dx} + x = 0$
(B)	Find m and n so that the given function is continuous at $x = 3$ if $f(x) = \begin{cases} mx & \text{if } x < 3 \\ n & \text{if } x = 3 \\ -2x + 9 & \text{if } x > 3 \end{cases}$
Q.6- (A)	Find $\int \sin^4 x \, dx$
(B)	Find the equation of the line through (5 , - 8) and perpendicular to join of A(-15 , -8), B(10 , 7)
Q.7-(A)	Evaluate $\int_{-1}^{2} (x + \lvert x \rvert) \, dx$
(B)	Maximize $f(x,y) = x + 3y$; subject to the constraints $2x + 5y \leq 30$, $5x + 4y \leq 20$, $x \geq 0$, $y \geq 0$
Q.8-(A)	Find the area of the region bounded by the triangle whose sides are $7x - y - 10 = 0$; $10x + y - 41 = 0$; $3x + 2y + 3 = 0$
(B)	Determine the equations of tangents to the circle $x^2 + y^2 = 2$ perpendicular to the line $3x + 2y = 6$
Q.9-(A)	By transforming the equation $x^4 + 4y^2 - 2x + 8y + 4 = 0$ referred to a new origin and axes remaining parallel to the original axes , the first terms are removed. Find the coordinates of the new origin and the transformed equation
(B)	Prove that : $\cos(\alpha - \beta) = \cos\alpha \cos\beta + \sin\alpha \sin\beta$

PAPER CODE - 8192

MATHEMATICS | **12th CLASS – 12022** | **TIME: 30 MINUTES**

GROUP : SECOND | **OBJECTIVE** | **MARKS: 20**

NOTE: You have four choices for each objective type question as A , B , C and D . The choice which you think is correct , fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

QUESTION NO. 1

1 $\lim_{n \to +\infty} \left(1+\frac{1}{n}\right)^{\frac{n}{2}}$ = ...

(A) e^n (B) e (C) $e^{1/2}$ (D) $e^{-1/2}$

2 If $f(x) = 2x + 1$, $g(x) = \frac{3}{x-1}$ $x \neq 1$ then $fog(x)$ = ...

(A) $\frac{5+x}{x-1}$ (B) $\frac{3}{2x}$ (C) $4x + 3$ (D) $\frac{3(x-1)}{4-x}$

3 $\frac{d}{dx} \cot h^{-1} x$ = ...

(A) $\frac{1}{1-x^2}$ (B) $\frac{1}{x^2-1}$ (C) $\frac{1}{1+x^2}$ (D) $\frac{-1}{1+x^2}$

4 $\frac{d}{dx} (x+4)^{1/3}$ = ...

(A) $(x+4)^{-1/3}$ (B) $\frac{1}{3}(x+4)^{-1/3}$ (C) $\frac{1}{3}(x+4)^{-2/3}$ (D) $\frac{1}{3}(x+4)^{2/3}$

5 $\frac{d}{dx} e^{\sin x}$ = ...

(A) $e^{\sin x}$ (B) $\cos x\, e^{\sin x}$ (C) $\sin x\, e^{\sin x - 1}$ (D) $-\cos x\, e^{\sin x}$

6 If f be a differentiable function on the open interval (a , b) then f is increasing function if .....

(A) $f'(x) < 0$ (B) $f'(x) > 0$ (C) $f(x) \leq 0$ (D) $f''(x) < 0$

7 $\int \frac{1}{ax+b}\, dx$ = ...

(A) $\ln|ax+b| + c$ (B) $\frac{ax+b}{a} + c$ (C) $\frac{-a}{(ax+b)^2} + c$ (D) $\frac{1}{a}\ln|ax+b| + c$

8 $\int (f(x))^{-1} f'(x)\, dx$ = ...

(A) $\ln|f(x)| + c$ (B) $\frac{[(f(x))^{-1}]^2}{2} + c$ (C) $(f(x))^{-1} + c$ (D) $f(x) + c$

9 $\int \tan^2 x\, dx$ = ...

(A) $\sec^2 x + c$ (B) $\sec^2 x - x + c$ (C) $x - \sec^2 x + c$ (D) $-\operatorname{cosec}^2 x + c$

10 Solution of the differential equation $x\frac{dy}{dx} = 1 + y$ is .....

(A) $c - \frac{1}{x}$ (B) ce^x (C) $y = cx - 1$ (D) $x^2 + y^2 = c$

11 Equation of horizontal line through (7 , - 9) is .....

(A) $y = -9$ (B) $y = 9$ (C) $x = 7$ (D) $x = -7$

12 Slope intercept form of the line $2x + y - 11 = 0$ is

(A) $\frac{x}{(11/2)} + \frac{y}{11} = 1$ (B) $y = -2x + 11$ (C) $y = 2x - 11$ (D) $y = -2x - 11$

13 If $\theta = 45^\circ$ be the inclination of the line with x-axis then slope of the line is .....

(A) $\frac{-1}{\sqrt{2}}$ (B) $\frac{1}{\sqrt{2}}$ (C) -1 (D) 1

14 The equation $ax^2 + 2hxy + by^2 = 0$ represents a pair of orthogonal lines if

(A) $h^2 - ab = 0$ (B) $a + b = 0$ (C) $h^2 + ab = 0$ (D) $a - b = 0$

15 The non-negative constraints used in a system of linear in equalities are called

(A) Problem constraints (B) Decision variable (C) Feasible solution (D) Optimal solution

16 Co-ordinate of the centre of the circle $x^2 + y^2 + 12x - 10y = 0$ is

(A) (6 , - 5) (B) (- 6 , - 5) (C) (- 6 , 5) (D) (6 , 5)

17 Focus of the parabola $x^2 = -4ax$ is

(A) (0 , - a) (B) (0 , a) (C) (- a , 0) (D) (a , 0)

18 Equation of Directrices of Hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

(A) $y = 0$ (B) $x = 0$ (C) $y = \pm\frac{c}{e^2}$ (D) $x = \pm\frac{c}{e^2}$

19 The value of $[\underline{i}\ \ \underline{i}\ \ \underline{k}]$ = ...

(A) 1 (B) 0 (C) -1 (D) $\underline{k}$

20 With usual notations in any triangle ABC $c\cos A + a\cos c$ = ...

(A) a (B) b (C) c (D) 1

MATHEMATICS | **12th CLASS - 12022** | **TIME : 2.30 HOURS**
GROUP : SECOND | **SUBJECTIVE** | **MARKS : 80**

SECTION-I

QUESTION NO. 2 Write short answers any Eight (8) of the following **16**

i	If $f(x) = x^2 - x$, Evaluate $f(x-1)$
ii	Explain Identity function by example
iii	Evaluate $\lim_{x \to \pi} \frac{\sin x}{\pi - x}$
iv	Show that $x = a \cos t$ and $y = a \sin t$ are the parametric equation of the circle $x^2 + y^2 = a^2$
v	Express $\lim_{n \to +\infty} \left(1 + \frac{3}{n}\right)^{2n}$ in terms of e
vi	If $x = t^2 + 1$, $y = t^2$ find $\frac{dy}{dx}$
vii	If $3x + 4y + 7 = 0$ then find $\frac{dy}{dx}$
viii	Differentiate $\frac{1}{a} \sin^{-1} \frac{a}{x}$ w.r.t x
ix	Find y_2 if $x^2 + y^2 = a^2$
x	Explain increasing function and give its example
xi	Differentiate sin x w.r.t cot x
xii	Calculate $\frac{d}{dx}(3x^{4/3})$

QUESTION NO. 3 Write short answers any Eight (8) of the following **16**

i	Evaluate $\int \frac{\cos 2x - 1}{1 + \cos 2x} dx$
ii	Evaluate $\int a^{x^2} x \, dx$
iii	Evaluate $\int \frac{dx}{\frac{1}{2}\sin x + \frac{\sqrt{3}}{2}\cos x}$
iv	Evaluate $\int (\text{en } x)^2 \, dx$
v	Find $\int_{-1}^{3} (x^3 + 3x^2) \, dx$
vi	If $\int_{-2}^{1} f(x) \, dx = 5$ and $\int_{-2}^{1} g(x) \, dx = 4$ Then evaluate $\int_{-2}^{1} (2f(x) + 3\, g(x)) \, dx$
vii	Find area between the x-axis and the curve $y = 4x - x^2$
viii	Check $y = \tan(e^x + c)$ is a solution of the differential equation of $\frac{dy}{dx} = \frac{y^2 + 1}{e^{-x}}$
ix	If the vertices of a triangular region are A(5 , 3) , B(-2 , 2) and C(4 , 2) . Find its area
x	Convert $5x - 12y + 39 = 0$ into slope intercept and intercept form
xi	Find the point three-fifth of the way along line segment from A(-5 , 8) to B(5 , 3)
xii	By means of slope show that the points (4 , -5) , (5 , 7) and (10 , 15) lies on a same line

QUESTION NO. 4 Write short answers any Nine (9) of the following **18**

i	Graph the solution set of linear inequality $3y - 4 \leq 0$ in xy – plane
ii	Define feasible region and feasible solution
iii	Find an equation of the circle with centre at $(\sqrt{2} , -3\sqrt{3})$ and radius $2\sqrt{2}$
iv	Find the focus and directrix of the parabola $y^2 = -8(x - 3)$
v	Find an equation of the ellipse with foci $(-3\sqrt{3} , 0)$ and vertices $(\pm 6 , 0)$
vi	Find focus of the parabola $x^2 - 4x - 8y + 4 = 0$
vii	Check the position of the point (5 , 6) with respect to the circle $x^2 + y^2 = 81$
viii	Find the centre and radius of the circle $4x^2 + 4y^2 - 8x + 12y - 25 = 0$
ix	Write the vector $\underline{PQ}$ in the form $x\underline{i} + y\underline{j}$ if P(0 , 5) , Q(-1 , -6)
x	Find the sum of the vectors $\underline{AB}$ and $\underline{CD}$ given that four points A(1 , -1) , B(2 , 0) , C(-1 , 3) , D(-2 , 2)
xi	Find a unit vector in the direction of $\underline{V} = \underline{i} + 2\underline{j} - \underline{k}$
xii	Find the cosines of angle θ between $\underline{U} = [2 , -3 , 1]$, $\underline{V} = [2 , 4 , 1]$
xiii	Prove that $\underline{a} \times (\underline{b} + \underline{c}) + \underline{b} \times (\underline{c} + \underline{a}) + \underline{c} \times (\underline{a} + \underline{b}) = 0$

(P.T.O)

SECTION-II

Note: Attempt any Three questions from this section **10 x 3 = 30**

Q.5- (A)	Find $\lim_{\theta \to 0} \frac{\tan\theta - \sin\theta}{\sin^3\theta}$
(B)	Prove that if $\frac{y}{x} = \tan^{-1}\frac{x}{y}$ then $\frac{dy}{dx} = \frac{y}{x}$
Q.6- (A)	Evaluate $\int \frac{x + \sin x}{1 + \cos x}\, dx$
(B)	Find an equation of line through (- 4 , 7) and parallel to the line $2x - 7y + 4 = 0$
Q.7-(A)	Evaluate $\int_0^{\pi/4} \frac{\sec\theta}{\sin\theta + \cos\theta}\, d\theta$
(B)	Graph the feasible region of the system of linear inequalities and find the corner points of $3x + 2y \geq 6$, $x + y \leq 4$, $x \geq 0$, $y \geq 0$
Q.8-(A)	Find a joint equation of the straight lines through the origin perpendicular to the lines represented by $x^2 + xy - 6y^2 = 0$
(B)	Find equation of the tangent drawn from (0 , 5) to $x^2 + y^2 = 16$
Q.9-(A)	Find the centre , foci , eccentricity , vertices and equations of directrices of $\frac{y^2}{4} - x^2 = 1$
(B)	Prove that : $\sin(\propto + \beta) = \sin \propto \cos\beta + \cos \propto \sin\beta$

PAPER CODE - 8193

MATHEMATICS | **12th CLASS – 12021** | **TIME: 30 MINUTES**

GROUP : FIRST | **OBJECTIVE** | **MARKS: 20**

NOTE: You have four choices for each objective type question as A , B , C and D . The choice which you think is correct , fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

QUESTION NO. 1

1 $\frac{d}{dx}(\cos^{-1}\frac{x}{a}) =$ .....

(A) $\frac{1}{1-x^2}$ (B) $\frac{1}{1+x^2}$ (C) $\frac{-1}{\sqrt{a^2-x^2}}$ (D) $\frac{1}{\sqrt{a^2-x^2}}$

2 If $y = \ln(\sin x)$, then $\frac{dy}{dx}$ is

(A) tanx (B) cotx (C) – tanx (D) – cotx

3 The minimum value of the function $f(x) = x^2 + 2x - 3$ is at x = ...

(A) – 3 (B) 1 (C) 0 (D) – 1

4 $\int x^{-1}\,dx =$ .....

(A) 0 + c (B) $-x^{-2} + c$ (C) $\frac{x^{-2}}{-2} + c$ (D) lnx + c

5 $\int \frac{1}{1+\cos x}\,dx =$

(A) $\frac{1}{2}\tan\frac{x}{2}$ (B) $\tan\frac{x}{2}$ (C) $\cot\frac{x}{2}$ (D) $\frac{1}{2}\cot\left(\frac{x}{2}\right)$

6 $\int_{\frac{1}{\sqrt{2}}}^{\sqrt{3}/2} \frac{dx}{\sqrt{1-x^2}} =$

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{12}$

7 The order of the differential equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 3x = 0$ is

(A) 1 (B) 2 (C) 0 (D) 3

8 The solution set of inequality $2x - 3 \geq 0$ is

(A) $\left[\frac{3}{2}, \infty\right]$ (B) $\left[\frac{2}{3}, \infty\right[$ (C) $\left[\frac{2}{3}, \infty\right]$ (D) $\left[\frac{3}{2}, 0\right[$

9 Perpendicular distance of the point P(6, 2) from the line $3x + 4y + 1 = 0$ is

(A) 3 (B) 11 (C) 2 (D) 4

10 The coordinates of the point that divides the join of A(-6 , 3) and B(5 , - 3) in the ratio 2 : 3 externally

(A) $\left(\frac{-8}{3}, 1\right)$ (B) $\left(\frac{8}{5}, -1\right)$ (C) (- 28 , 13) (D) (28 , - 13)

11 If coordinates of the mid points of the sides of a triangle are (3 , 2) , (2 , 3) and (1 , - 1) , then the area of the triangle is

(A) 10 sq. units (B) 6 sq. units (C) 11 sq. units (D) 5 sq. units

12 The latus rectum of a parabola $y^2 = 4ax$ is

(A) y = - a (B) x = - a (C) y = a (D) x = a

13 Condition that line $y = mx + c$ is tangent to the circle $x^2 + y^2 = a^2$ is

(A) $c = \pm m\sqrt{1 + a^2}$ (B) $c = \pm m\sqrt{1 - a^2}$ (C) $c = \pm a\sqrt{1 - m^2}$ (D) $c = \pm a\sqrt{1 + m^2}$

14 The projection of $\underline{u} = a\underline{i} + b\underline{j} + c\underline{k}$ along $\underline{i}$ is

(A) 0 (B) b (C) a (D) c

15 A constant force $\underline{F}$ acting on a body , displaces it from A to B. The work done by $\underline{F}$ is

(A) $\underline{F}.\underline{AB}$ (B) $\underline{F} \times \underline{AB}$ (C) $-\underline{F} \times \underline{AB}$ (D) $-\underline{F}.\underline{AB}$

16 The angle between the vectors $4\underline{i} + 2\underline{j} - \underline{k}$ and $-\underline{i} + \underline{j} - 2\underline{k}$ is

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{2}$ (D) π

17 The coordinates of vertices of hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is

(A) (± a , 0) (B) (0 , ± b) (C) (0 , ± a) (D) (± b , 0)

18 If $f(x) = -2x+6$, then $f^{-1}(x) =$ .....

(A) 6 – 2x (B) $\frac{6-x}{2}$ (C) $\frac{2}{6-x}$ (D) 2x – 6

19 $\lim_{x \to 0}(1 + 3x)^{2/x} =$ .....

(A) e^2 (B) e^8 (C) e^6 (D) e^4

20 If $f(x) = \tan x$, then $f'(\frac{\pi}{4}) =$ .....

(A) 1 (B) $\frac{1}{2}$ (C) 2 (D) $\frac{1}{3}$

QUESTION NO. 2 Write short answers any Eight (8) of the following 16

1	Find the Domain and Range of $f(x) = x$
2	Determine whether the function $f(x) = \frac{3x}{x^2+1}$ is even or odd
3	For the functions $f(x) = 3x^4 - 2x^2$, $g(x) = \frac{2}{\sqrt{x}}$ find fog(x) and gof(x)
4	Evaluate $\lim_{x \to \infty} \frac{5x^4-10x^2+1}{3x^3+10x^2+50}$
5	Find by definition the derivative of $\frac{1}{x^3}$
6	Differentiate $\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2$. w.r.t x
7	Find $\frac{dy}{dx}$ if $x^2 - 4xy - 5y = 0$
8	Differentiate sin x w.r.t cot x
9	For $f(x) = \ln \sqrt{e^{2x} + e^{-2x}}$; find $f'(x)$
10	Find y_1 if $x^3 - y^3 = a^3$
11	Find extreme values of $f(x) = 2x^3 - 2x^2 - 36x + 3$
12	Find $\frac{dy}{dx}$ if $y = \ln(\tan h\, x)$

QUESTION NO. 3 Write short answers any Eight (8) of the following 16

1	Find dy if $y = x^2 + 2x$, when x changes from 2 to 1.8
2	Evaluate $\int \frac{(1-\sqrt{x})^2}{\sqrt{x}}\, dx$ $(x > 0)$
3	Evaluate $\int \frac{\cot\sqrt{x}}{\sqrt{x}}\, dx$
4	Evaluate $\int e^x (\cos x + \sin x)\, dx$
5	Evaluate $\int_1^2 \frac{x}{x^2+2}\, dx$
6	Evaluate $\int_0^{\pi/3} \cos^2 x \cdot \sin x\, dx$
7	Find the area between the x-axis and the curve $y = x^2 + 1$ from $x = 1$ to $x = 2$
8	Solve the differential equation $\frac{dy}{dx} = -y$
9	Show that the points A(0,2) , B($\sqrt{3}$, -1) and C(0,-2) are vertices of a right triangle
10	Find an equation of the line through (- 4 ,- 6) and perpendicular to a line having slope $-3/2$
11	Find whether the point (5,8) lies above or below the line $2x - 3y + 6 = 0$
12	Find the lines represented by $20x^2 + 17xy - 24y^2 = 0$

QUESTION NO. 4 Write short answers any Nine (9) of the following 18

1	Graph the solution set of $2x + y \leq 6$
2	Find equation of circle with ends of a diameter at (- 3 , 2) and (5 , - 6)
3	Find centre and radius of circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$
4	Find vertex and directrix of parabola $x^2 = -16y$
5	Find an equation of parabola whose focus is F(-3,4) and directrix $3x - 4y + 5 = 0$
6	Find focii and vertices of Hyperbola $\frac{y^2}{16} - \frac{x^2}{49} = 1$
7	Find centre and eccentricity of $\frac{x^2}{4} - \frac{y^2}{9} = 1$
8	Find magnitude of vector $\underline{u} = \underline{i} + \underline{j}$
9	Find a unit vector in the direction of $\underline{v} = [-2, 4]$
10	Find a vector of length 5 in the direction opposite that of $\underline{v} = \underline{i} - 2\underline{j} + 3\underline{k}$
11	If $\underline{v}$ is a vector for which $\underline{v} \cdot \underline{i} = 0$, $\underline{v} \cdot \underline{j} = 0$, $\underline{v} \cdot \underline{k} = 0$ Find $\underline{v}$
12	Compute $\underline{a} \times \underline{b}$ if $\underline{a} = -4\underline{i} + \underline{j} - 2\underline{k}$, $\underline{b} = 2\underline{i} + \underline{j} + \underline{k}$
13	Find the value of $3\underline{j} \cdot \underline{k} \times \underline{i}$

SECTION-II

Note: Attempt any Three questions from this section **10 x 3 = 30**

Q.5-(A)	If $f(x) = \begin{cases} \frac{\sqrt{2x+5}-\sqrt{x+7}}{x-2} & x \neq 2 \\ k & x = 2 \end{cases}$ Find k so that f(x) is continuous at x = 2
(B)	Prove that $y\frac{dy}{dx} + x = 0$ if $x = \frac{1-t^2}{1+t^2}$, $y = \frac{2t}{1+t^2}$
Q.6-(A)	Evaluate $\int \frac{x \sin^{-1}x}{\sqrt{1-x^2}}$ dx
(B)	One vertex of a parallelogram is (1 , 4) , the diagonals intersects at (2 , 1) and the sides have slopes 1 and $-\frac{1}{7}$. Find the other three vertices
Q.7-(A)	Solve the differential equation $\sec^2 x \tan y\, dx + \sec^2 y \tan x\, dy = 0$
(B)	Maximize $f(x,y) = x + 3y$ subject to constraints $2x + 5y \leq 30$, $5x + 4y \leq 20$, $x \geq 0$, $y \geq 0$
Q.8-(A)	Find equation of circle passing through A(-7 , 7) , B(5 , - 1) , C(10 , 0)
(B)	Show that mid-point of hypotenuse of a right angle triangle is equidistance from its vertices
Q.9-(A)	If $y = a\cos(\ln x) + b\sin(\ln x)$, Prove that $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$
(B)	Find the centre , foci , eccentricity and vertices of $9x^2 - 12x - y^2 - 2y + 2 = 0$

PAPER CODE - 8196

MATHEMATICS | **12th CLASS – 12021** | **TIME: 30 MINUTES**

GROUP : SECOND | **OBJECTIVE** | **MARKS: 20**

NOTE: You have four choices for each objective type question as A , B , C and D . The choice which you think is correct , fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

QUESTION NO. 1

1 $\int \tan x\,dx$ = ...
(A) $\ln|\sec x| + c$ (B) $\ln|\operatorname{cosec} x| + c$ (C) $\ln|\cos x| + c$ (D) $\ln|\sin x| + c$

2 $\int \ln x^{-1} dx$ = ...
(A) $x \ln x + x + c$ (B) $-x \ln x + x + c$ (C) $-x - x\ln x + c$ (D) $x + \ln x + c$

3 $\int_0^{\pi/2} \sin x\,dx$ = ...
(A) 1 (B) 2 (C) 4 (D) 6

4 $\int \left(\frac{1}{x} + \ln x\right) e^x\,dx$ = ...
(A) $\frac{1}{x} e^x + c$ (B) $e^x \ln x + c$ (C) $e^x \frac{\ln x}{x} + c$ (D) $\frac{\ln x}{x} + c$

5 If m_1 and m_2 are slopes of two lines , then lines are perpendicular if
(A) $m_1 m_2 = 1$ (B) $m_1 = m_2$ (C) $m_1 m_2 = -1$ (D) $m_1 = -m_2$

6 An equation of horizontal line through point P(7 , -9) is
(A) $y = -9$ (B) $y = 9$ (C) $x = 7$ (D) $x = -7$

7 The perpendicular distance of the line $3x + 4y + 10 = 0$ from (0 , 0) is
(A) 0 (B) 1 (C) 2 (D) 10

8 $x = 5$ is the solution of inequality
(A) $2x - 3 > 0$ (B) $2x + 3 < 0$ (C) $x + 4 < 0$ (D) $x < 0$

9 The radius of circle $(x-5)^2 + (y-3)^2 = 8$ is
(A) 2 (B) $2\sqrt{2}$ (C) 4 (D) 64

10 The vertex of parabola $(x-1)^2 = 8(y+2)$ is
(A) (1 , 2) (B) (0 , 1) (C) (-1 , -2) (D) (1 , -2)

11 $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is the standard equation of
(A) Circle (B) Parabola (C) Ellipse (D) Hyperbola

12 If $\underline{u} = 2\underline{i} + 4\underline{j} + 7\underline{k}$ and $\underline{v} = 2\underline{i} + 6\underline{j} + \propto \underline{k}$ are perpendicular , then $\propto$ = ?
(A) -4 (B) 4 (C) 28 (D) 0

13 $2\underline{k} \cdot \underline{j} \times \underline{i}$ is equal to
(A) 1 (B) -1 (C) -2 (D) 2

14 If $u = 2\underline{i} - \underline{j} - 2\underline{k}$, then $|u|$ = ?
(A) 2 (B) 3 (C) 4 (D) 5

15 $f(x) = \cos x + \sin x$ is ..... function
(A) Even (B) Odd (C) Both even and odd (D) Neither even nor odd

16 $\lim_{x \to \infty} \left(1 + \frac{3}{n}\right)^{2n}$ = ...
(A) e^2 (B) e^4 (C) e^6 (D) e^9

17 $\frac{d}{dx}\left(\frac{1}{\sqrt{x}}\right)$ = ...
(A) $\frac{1}{2x\sqrt{x}}$ (B) $-\frac{1}{2x\sqrt{x}}$ (C) $\frac{\sqrt{x}}{2}$ (D) $-\frac{\sqrt{x}}{2}$

18 $\frac{d}{dx}(\cos x^2)$ = ...
(A) $-\sin x^2$ (B) $2x \sin x^2$ (C) $-2x \sin x^2$ (D) $\sin x . 2x$

19 If $y = 5e^{3x-4}$, then $\frac{dy}{dx}$ = ...
(A) $15e^{3x-4}$ (B) $-15e^{3x-4}$ (C) $20e^{3x-4}$ (D) $-20e^{3x-4}$

20 If $y = \sin 3x$, then y_2 = ...
(A) $3\cos 3x$ (B) $9\sin 3x$ (C) $9\cos 3x$ (D) $-9\sin 3x$

ATHEMATICS
ROUP : SECOND

12th CLASS - 12021
SUBJECTIVE
SECTION-I

TIME : 2.30 HOURS
MARKS : 80

QUESTION NO. 2 Write short answers any Eight (8) of the following 16

1	Find fof(x) for $f(x) = \sqrt{x+1}$, $g(x) = \frac{1}{x^2}$, $x \neq 0$
2	Find $f^{-1}(x)$ if $f(x) = (-x+9)^3$
3	Find f(x-1) if $f(x) = \sqrt{x+4}$
4	Find $\frac{f(a+h)-f(a)}{h}$, for $f(x) = \sin x$
5	If $y = \sqrt{x} - \frac{1}{\sqrt{x}}$, show that $\frac{2xdy}{dx} + y = 2\sqrt{x}$
6	Differentiate w.r.t x If $y = \frac{2x-1}{\sqrt{x^2+1}}$
7	Differentiate $\frac{x^2+1}{x^2-1}$ w.r.t , x^3
8	Find $\frac{dy}{dx}$ if $y = x \cos y$
9	Find $\frac{dy}{dx}$ if $y = e^{-x}(x^3+2x^2+1)$
10	Find $\frac{dy}{dx}$ if $y = \ln(\tan h\, x)$
11	Find $\frac{dy}{dx}$ if $y = \sin h^{-1}(x^3)$
12	Find y_2 if $y = x^2 e^{-x}$

QUESTION NO. 3 Write short answers any Eight (8) of the following 16

1	Find dy if $y = x^2$ and x changes from 2 to 2.01
2	Evaluate $\int \frac{\sin x + \cos^3 x}{\cos^2 x \sin x}\, dx$
3	Evaluate the given integral $\int \sin^2 x\, dx$
4	Evaluate $\int \cos x \left(\frac{\ln \sin x}{\sin x}\right) dx$
5	Find the antiderivative of $\sin^{-1} x$
6	Evaluate the definite integral $\int_0^{\pi/2} \cos^2\theta \sin\theta\, d\theta$
7	Solve the differential equation $\frac{dy}{dx} = y^2 + 1/e^{-x}$
8	The length of perpendicular from the origin to a line is 5 units and the inclination of this perpendicular is 120°. Find the slope of the line
9	Find an equation of the line through (-5 , -3) and (9 , -1)
10	Convert the given equation into normal form : $4x + 7y - 2 = 0$
11	Find an equation of each of the lines represented by : $20x^2 + 17xy - 24y^2 = 0$
12	Find the interior angles (any two) of the triangle whose vertices are : A(6 , 1) , B(2 , 7) , C(- 6 , - 7)

QUESTION NO. 4 Write short answers any Nine (9) of the following 18

1	Graph the solution set of $5x - 4y \leq 20$
2	Find the sum of $\overrightarrow{AB}$ and $\overrightarrow{CD}$ given the four points A(1, -1) , B(2,0) , C(-1,3) and D(-2,2)
3	Find $2\overrightarrow{CB} - 2\overrightarrow{CA}$ if A = (2 , 5) , B = (-1 , 1) and C = (2 , - 6)
4	Find a vector whose magnitude is 2 and is parallel to $-\underline{i} + \underline{j} + \underline{k}$
5	If $\underline{v}$ is a vector for which $\underline{v} \cdot \underline{i} = 0$, $\underline{v} \cdot \underline{j} = 0$, $\underline{v} \cdot \underline{k} = 0$ then find $\underline{v}$
6	A force $\vec{F} = 7\underline{i} + 4\underline{j} - 3\underline{k}$ is applied at P(1,-2,3). Find its moment about the point Q(2,1,1)
7	If $\underline{a} = 2\underline{i} + \underline{j} - \underline{k}$, $\underline{b} = \underline{i} - \underline{j} + \underline{k}$ find $\underline{b} \times \underline{a}$ and show $\underline{b} \times \underline{a}$ is perpendicular to $\underline{a}$
8	Find centre and radius of circle $4x^2 + 4y^2 - 8x + 12y - 25 = 0$
9	Find the length of the tangent from the point P(-5 , 10) to the circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$
10	Find focus and vertex of the parabola $x^2 = -16y$
11	Find eccentricity and vertices of $9x^2 - 12x - y^2 - 2y + 2 = 0$
12	Find an equation of the tangent to the conic $x^2 - xy + y^2 - 2 = 0$ at the point whose ordinate is $\sqrt{2}$

SECTION-II

Note: Attempt any Three questions from this section **10 x 3 = 30**

Q.5- (A)	Evaluate $\lim_{\theta \to 0} \frac{1-\cos p\theta}{1-\cos q\theta}$
(B)	Find $\frac{dy}{dx}$ if $x = a(\cos t + \sin t)$, $y = a(\sin t - t\cos t)$
Q.6- (A)	Evaluate $\int \sqrt{x^2+4}\ dx$
(B)	One vertex of a parallelogram is (1 , 4) , the diagonals intersect at (2 , 1) and the sides have slope 1 and $-\frac{1}{7}$. Find the other three vertices
Q.7-(A)	Evaluate $\int_0^{\pi/4} \frac{\cos\theta+\sin\theta}{\cos 2\theta+1}\ d\theta$
(B)	Graph the feasible region of the following system of linear inequalities and find the corner points $3x + 7y \leq 21$, $x - y \leq 3$, $x \geq 0$, $y \geq 0$
Q.8-(A)	Find the coordinates of the points of intersection of the line $x + 2y = 6$ with the circle $x^2 + y^2 - 2x - 2y - 39 = 0$
(B)	Use vectors prove that $\cos(\propto + \beta) = \cos \propto \cos \beta - \sin \propto \sin \beta$
Q.9-(A)	If $y = (\cos^{-1}x)^2$ then prove that $(1 - x^2)\, y_2 - xy_1 - 2 = 0$
(B)	Find an equation of the parabola whose focus is (- 3 , 4) and directrix is $3x - 4y + 5 = 0$

PAPER CODE - 8191

MATHEMATICS | **12th CLASS – 12019** | TIME: 30 MINUTES

GROUP FIRST | **OBJECTIVE** | MARKS: 20

NOTE: You have four choices for each objective type question as A , B , C and D . The choice which you think is correct , fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

QUESTION NO. 1

(1) If $f(-x) = -f(x)$, then $f(x)$ is called

(A) Linear function (B) Parametric function (C) Even function (D) Odd function

(2) $\lim_{\theta \to 0} \frac{1-\cos p\theta}{1+\cos p\theta}$ equals

(A) 1 (B) 0 (C) −1 (D) 2

(3) $\lim_{x \to a} \frac{f(x)-f(a)}{x-a}$ equals

(A) $f'(a)$ (B) $f'(x)$ (C) $f'(0)$ (D) $f(x)$

(4) The derivative of $e^{\sin x}$, w.r.t x will be equal to

(A) $e^{\cos x}$ (B) $e^{\sin x}$ (C) $e^{\sin x}.\cos x$ (D) $e^{\sin x}.\sin x$

(5) $\frac{d}{dx}\cosh(2x)$ equals

(A) 2 sinh 2x (B) -2 sinh 2x (C) 2 sinh x (D) - 2 sinh x

(6) Second term in Maclaurin Series expansion of $f(x) = e^x$ equals

(A) 1 (B) x^2 (C) x (D) x^3

(7) $\int \frac{1}{\sqrt{a^2-x^2}}dx$; $-a < x < a$; equals

(A) $\cos^{-1}\left(\frac{x}{a}\right)\frac{x}{a} + c$ (B) $\sin^{-1}\left(\frac{x}{a}\right) + c$ (C) $\frac{1}{a}\cos^{-1}\left(\frac{x}{a}\right) + c$ (D) $\frac{1}{a}\sin^{-1}\left(\frac{x}{a}\right) + c$

(8) $\int \frac{1}{1+\cos x}dx$ equals

(A) $\cot\left(\frac{x}{2}\right) + c$ (B) $\cot\left(\frac{2}{x}\right) + c$ (C) $\tan\left(\frac{2}{x}\right) + c$ (D) $\tan\left(\frac{x}{2}\right) + c$

(9) $\int_0^1 (5x^4 - 3x^2 + 1)dx$ equals

(A) 1 (B) 2 (C) 0 (D) 3

(10) If $x\frac{dy}{dx} - y = 0$ then y equals

(A) x^2 (B) $\frac{x^2}{c}$ (C) cx (D) $\frac{c}{x}$

(11) If distance between two points (3,1) and (k , 2) is '1', then value of ' k ' will be

(A) −3 (B) 3 (C) 1 (D) 2

(12) Slope – intercept form of line will be

(A) $\frac{x}{a} + \frac{y}{b} = 1$ (B) $x\cos\theta + y\sin\theta = p$ (C) $y - y_1 = m(x - x_1)$ (D) $y = mx + c$

(13) If the line $\frac{x}{a} + \frac{y}{3} = 1$ is parallel to the line $3x - 2y + 4 = 0$, then value of 'a' equals

(A) -2 (B) 2 (C) 3 (D) 4

(14) The point of intersection of two lines $x - 2y + 1 = 0$ and $x + 3y - 4 = 0$ is

(A) (-1,-1) (B) (-1, 1) (C) (1, 1) (D) (1, -1)

(15) Feasible region of inequalities is always restricted to the quadrant

(A) II (B) I (C) III D) IV

(16) The equation of directrix of parabola $y^2 = 4ax$ will be equal to

(A) $y + a = 0$ (B) $y - a = 0$ (C) $x - a = 0$ (D) $x + a = 0$

(17) If the line $6x + 4y + c = 0$ passes through the centre of circle $x^2 + y^2 + 2x + 3 = 0$, then value of ' c ' will be

(A) - 6 (B) 6 (C) -4 (D) 4

(18) The co-ordinates of vertices of hyperbola $\frac{x^2}{4} - \frac{y^2}{9} = 1$ will be

(A) $(0, \pm 3)$ (B) $(\pm 3, 0)$ (C) $(0, \pm 2)$ (D) $(\pm 2, 0)$

(19) The area of triangle with $\underline{a}$ and $\underline{b}$ as its adjacent sides equals

(A) $\frac{1}{2}|\underline{a} \times \underline{b}|$ (B) $2|\underline{a} \times \underline{b}|$ (C) $\frac{1}{2}(\underline{a} \times \underline{b})$ (D) $2(\underline{a} \times \underline{b})$

(20) If $\underline{a}$ and $\underline{b}$ are two non zeros vectors , then the angle between $\underline{a}$ and $\underline{a} \times \underline{b}$ equals

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{2}$ (D) $\frac{2\pi}{3}$

MATHEMATICS
GROUP FIRST

12th CLASS - 12019
SUBJECTIVE

TIME : 2.30 HOURS
MARKS : 80

SECTION-I

QUESTION NO. 2 Write short answers any Eight (8) questions of the following 16

1	Given $f(x) = x^3 - 2x^2 + 4x - 1$, find the value of $f(1+x)$
2	Evaluate $\lim_{\theta \to 0} \frac{1-\cos\theta}{\sin\theta}$
3	If $f(x) = \begin{cases} x+2, & x \leq -1 \\ c+2, & x > -1 \end{cases}$ Find $\lim_{x \to -1} - f(x)$
4	Find $\frac{dy}{dx}$ if $y = (x^2+5)(x^3+7)$
5	Find $\frac{dy}{dx}$ if $y^2 + x^2 - 4x = 5$
6	Differentiate $(1+x^2)^n$ w.r.t. x^2
7	Differentiate w. r. t x $\cos^{-1}\frac{x}{a}$
8	Define stationary point of a function.
9	Find $\frac{dy}{dx}$ if $y = \ln \tanh x$
10	Find $\frac{dy}{dx}$ if $y = \sqrt{x+\sqrt{x}}$
11	Find $\frac{dy}{dx}$ if $y = x \cos y$
12	Find y_2 if $x^2 + y^2 = a^2$

QUESTION NO. 3 Write short answers any Eight (8) questions of the following 16

1	Find δy if $y = x^2 + 2x$ when x changes from 2 to 1.8
2	Use differentials ,find the approximate value of $\sqrt[3]{17}$
3	Evaluate $\int 3^{2x}\, dx$
4	Evaluate $\int \frac{1}{\sqrt{x}(\sqrt{x}+1}\, dx$, $x > 0$
5	Evaluate $\int \frac{x}{x+2}\, dx$
6	Evaluate $\int \frac{e^x}{e^x+3}\, dx$
7	Evaluate $\int \frac{\cos x}{\sin x \ln \sin x}\, dx$
8	Evaluate $\int \frac{e^{m\tan^{-1}x}}{(1+x^2)}\, dx$
9	Write fundamental theorem of calculus
10	Evaluate $\int_{-1}^{3} (x^3 + 3x^2)\, dx$
11	Define Problem constraints .
12	Graph the solution set of $2x + 1 \geq 0$

QUESTION NO. 4 Write short answers any Nine (9) questions of the following 18

1	Show that for the points A(3,1) , B(-2,-3) and C(2, 2) , $\|AB\| = \|BC\|$
2	The length of perpendicular from the origin to a line is 5 units and the inclination of this perpendicular is 120°. Find the slope and y, intercepts of the line.
3	Find distance from the point P(6,-1) to the line $6x - 4y + 9 = 0$
4	Determine the value of p, such that the lines $2x - 3y - 1 = 0$, $3x - y - 5 = 0$ and $3x + py + 8 = 0$ are concurrent.
5	Find an equation of the circle having the join of $A(x_1, y_1)$ and $B(x_2, y_2)$ as a diameter.
6	Find the focus and directrix of the Parabola $y^2 = 8x$
7	Find eccentricity of the ellipse $4x^2 + 9y^2 = 36$
8	Find the points of intersection of the conics $x^2 + y^2 = 8$ and $x^2 - y^2 = 1$
9	Prove that the vectors $\hat{i} - 2\hat{j} + 3\hat{k}$, $-2\hat{i} + 3\hat{j} - 4\hat{k}$ and $\hat{i} - 3\hat{j} + 5\hat{k}$ are coplanar.
10	If $\vec{a} + \vec{b} + \vec{c} = 0$. then prove that $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a}$
11	Calculate the projection of $\vec{a}$ along $\vec{b}$ when $\vec{a} = 3\hat{i} + \hat{j} - \hat{k}$, $\vec{b} = -2\hat{i} - \hat{j} + \hat{k}$
12	Define scalar and vector product of two vectors.
13	Define a unit vector.

(P.T.O)

SECTION-II

Note: Attempt any Three questions from this section **10 x 3 = 30**

Q.5- (A)	Prove that $\lim_{n \to \infty} \left(1+\frac{1}{n}\right)^n = e$
(B)	Show that $\cos(x+h) = \cos x - h\sin x - \frac{h^2}{2!}\cos x + \frac{h^3}{3!}\sin x + \ldots\ldots$ Also evaluate $\cos 61^\circ$.
Q.6- (A)	Evaluate $\int \frac{dx}{\sqrt{x+a}+\sqrt{x+b}}$ $x+a>0$, $x+b>0$
(B)	The points A (-1,2) , B (6,3) and C (2,-4) are vertices of a triangle show that the line joining midpoint D of AB and midpoint E of AC is parallel to BC and $DE = \frac{1}{2}BC$
Q.7-(A)	Solve the differential equation $x\,dy + y(x-1)\,dx = 0$
(B)	Graph the feasible region of the system of linear inequalities and find the corner points $2x - 3y \leq 6$, $2x+3y \leq 12$, $x \geq 0$, $y \geq 0$
Q.8-(A)	Find the co-ordinates of the vertices of the triangle formed by the lines: $x - 2y - 6 = 0$; $3x - y + 3 = 0$; $2x + y - 4 = 0$ Also find measures of the angles of the triangle.
(B)	Find equation of the tangent to the circle $x^2 + y^2 = 2$ and parallel to the line $3x + 2y = 6$
Q.9-(A)	Show that the equation $9x^2 - 18x - 4y^2 + 8y - 23 = 0$ represents an ellipse. Find its centre , foci and eccentricity .
(B)	Prove that four points A (-3 , 5, - 4) , B (-1 , 1 , 1) , C (-1 , 2 , 2) and D (- 3 , 4 , -5) are coplanar.

PAPER CODE - 8192

12th CLASS – 12019

MATHEMATICS
GROUP SECOND

TIME: 30 MINUTES
MARKS: 20

OBJECTIVE

NOTE: You have four choices for each objective type question as A , B , C and D . The choice which you think is correct , fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

QUESTION NO. 1

(1) The area of a circle of unit radius is nearly
(A) 3.1 (B) 3.14 (C) 3.142 (D) $\frac{\pi}{2}$

(2) $\lim_{n \to \infty} \left(1 - \frac{1}{n}\right)^n =$
(A) e (B) $\frac{1}{e}$ (C) n (D) $\frac{1}{n}$

(3) $\lim_{h \to 0} \frac{f(a+h) - f(a)}{h} =$
(A) f(a) (B) f'(a + h) (C) f'(x) (D) f'(a)

(4) $\frac{d}{dx}(\tanh^{-1} x) =$
(A) $\frac{1}{1+x^2}$ (B) $\frac{1}{1-x^2}$ (C) $\frac{1}{\sqrt{1+x^2}}$ (D) $\frac{1}{\sqrt{1-x^2}}$

(5) The derivative of $y = \log_a x$ w. r. t . x is
(A) $\frac{1}{x}$ (B) $\frac{1}{x \ln a}$ (C) $\frac{\ln a}{x}$ (D) x ln a

(6) $f(x) = (1 + x)^n$, f'(0) will be
(A) 0 (B) n (C) 1 (D) n!

(7) $\int a^x dx =$
(A) $\frac{1}{x}$ (B) $\frac{a^x}{\ln a}$ (C) $\ln a . a^x$ (D) 0

(8) $\int_{-\pi}^{\pi} \sin x \, dx =$
(A) 0 (B) $\frac{\pi}{2}$ (C) π (D) $\frac{3\pi}{2}$

(9) $\int_a^x 3t^2 . dt =$
(A) $x^3 - a^3$ (B) t^3 (C) $t^3 - a^3$ (D) 0

(10) The order of $x \frac{d^2y}{dx^2} + \frac{dy}{dx} - 3x = 0$ is
(A) 0 (B) - 3 (C) 1 (D) 2

(11) The non-negative constrains are called
(A) Decision Variables (B) Feasible Solution set (C) Optimal Solution (D)Associated Equation

(12) Equation of a non vertical line with slope m and y intercept zero is
(A) y = x (B) y = mx (C) y = mx + c (D) y = 0

(13) The lines $ax^2 + 2hxy + by^2 = 0$ will be parallel if
(A) $h^2 < ab$ (B) $h^2 = ab$ (C) $h^2 > ab$ (D) a+b = 2

(14) The centriod of the triangle Δ ABC with vertices A(0,0), B(1,0), C(3,4) is
(A) (0 , 0) (B) (1 , 1) (C) (2 , 2) (D) $(\frac{4}{3}, \frac{4}{3})$

(15) The distance of the line $2x - 5y + 13 = 0$ from the point (0 , 0) is
(A) 13 (B) 10 (C) 4 (D) $\frac{13}{\sqrt{29}}$

(16) The radius of the circle $x^2 + y^2 + 4x - 6y - 3 = 0$
(A) 7 (B) 10 (C) 4 (D) 6

(17) x . y = 1 represents
(A) Circle (B) Parabola (C) Ellipse (D) Hyperbola

(18) A solution of the inequality $x + 2y < 6$ is
(A) (1, 1) (B) (4, 4) (C) (6, 2) (D) (5, 4)

(19) A force $\vec{F}$ is applied at an angle of measure $\frac{\pi}{2}$ with the displacement vector $\vec{r}$. The work done will be
(A) $\vec{F} \times \vec{r}$ (B) $\frac{\pi}{2}$ (C) 0 (D) infinite

(20) The projection of a vector $\vec{b}$ along $\vec{a}$ is
(A) $\frac{\vec{a} . \vec{b}}{|a|}$ (B) $\frac{\vec{a} . \vec{b}}{|b|}$ (C) $\vec{a} . \vec{b}$ (D) $\frac{\vec{a}}{\vec{b}}$

MATHEMATICS
GROUP SECOND

12th CLASS - 12019
SUBJECTIVE
SECTION-I

TIME : 2.30 HOURS
MARKS : 80

QUESTION NO. 2 Write short answers any Eight (8) questions of the following 16

1	Define odd and even functions.
2	Find $f^{-1}(x)$ if $f(x) = 3x^3 + 7$
3	Evaluate $\lim_{x \to \pi} \frac{\sin x}{\pi - x}$
4	Find $\frac{dy}{dx}$ if $y = (\sqrt{x} - \frac{1}{\sqrt{x}})^2$
5	Find $\frac{dy}{dx}$ if $xy + y^2 = 2$
6	Differentiate $x^2.\sec 4x$ w.r.t. " x".
7	Find $\frac{dy}{dx}$ if $y = \ln(x + \sqrt{x^2 + 1})$
8	Find y_2 if $x^3 - y^3 = a^3$
9	Define stationary point.
10	Find $\frac{dy}{dx}$, if $y = \tan h^{-1}(\sin x)$
11	Find extreme values for $f(x) = x^2 - x - 2$
12	Prove that $e^{2x} = 1 + 2x + \frac{4x^2}{2!} + \ldots\ldots\ldots$ by Maclauren Series expansion

QUESTION NO. 3 Write short answers any Eight (8) questions of the following 16

1	Find dy for $y\sqrt{x}$ when x changes from 4 to 4.41
2	Using differentials find $\frac{dy}{dx}$ for $x^4 + y^2 = xy^2$
3	Evaluate $\int \frac{3 - \cos 2x}{1 + \cos 2x}\, dx$
4	Evaluate $\int \frac{\sqrt{y}(y+1)}{y}\, dy$, $y > 0$
5	Evaluate $\int \frac{\sec^2 x}{\sqrt{\tan x}}\, dx$
6	Evaluate $\int x \tan^2 x\, dx$
7	Evaluate $\int x^3 \ln x\, dx$
8	Evaluate $\int e^{-x}(\cos x - \sin x)\, dx$
9	Evaluate $\int_0^{\pi/4} \sec x(\sec x + \tan x)\, dx$
10	Evaluate $\int_{-1}^{1} (x + \frac{1}{2})\sqrt{x^2 + x + 1}\, dx$
11	Define order of a differential equation.
12	Graph the solution set of linear inequality $3x - 2y \geq 6$

QUESTION NO. 4 Write short answers any Nine (9) questions of the following 18

1	Show that the lines $2x+y-3 = 0$ and $4x + 2y + 5 = 0$ are parallel.
2	Transform the equation $5x - 12y + 39 = 0$ into normal form.
3	Check whether the point P(5,-8) lies above or below the line $3x + 7y + 15 = 0$
4	Find the distance between the points A (3, 1), B(-2, -4).
5	Find the centre and radius of the circle $4x^2 + 4y^2 - 8x + 12y - 25 = 0$
6	Find the focus and the vertex of the parabola $x^2 = 5y$
7	Find the point of intersection of the conics $x^2 + y^2 = 8$ and $x^2 - y^2 = 1$
8	Find an equation of hyperbola with foci $(0, \pm 6)$, $e = 2$.
9	Find a unit vector in the direction of $\underline{V} = \underline{i} + 2\underline{j} - \underline{k}$
10	Find a vector perpendicular to $\underline{a} = \underline{i} + \underline{j}$ and $\underline{b} = \underline{i} - \underline{j}$
11	If $\underline{U} = 2\underline{i} - \underline{j} + \underline{k}$ and $\underline{V} = -\underline{i} + \underline{j}$ then find $\underline{U}.\underline{V}$
12	Define scalar triple product.
13	If $\underline{U} = 2\underline{i} + 3\underline{j} + \underline{k}$, $\underline{V} = 4\underline{i} + 6\underline{j} + 2\underline{k}$ then find $\lvert\underline{U} + 2\underline{V}\rvert$

SECTION-II

Note: Attempt any Three questions from this section $10 \times 3 = 30$

Q.5-(A)	Find the graphical solution of the equation $x = \sin 2x$
(B)	Show that $\frac{dy}{dx} = \frac{y}{x}$ if $\frac{y}{x} = \tan^{-1}\frac{x}{y}$
Q.6-(A)	Find $\int \sqrt{a^2 - x^2}\, dx$
(B)	Three points A (7, -1) , B (-2, 2) and (1,1) are consecutive vertices of a parallelogram. Find the fourth vertex
Q.7-(A)	Solve the differential equation $(y - x\frac{dy}{dx}) = 2(y^2 + \frac{dy}{dx})$
(B)	Graph the feasible region and find the corner points $x + 3y \leq 15$, $2x + y \leq 12$, $x \geq 0$, $y \geq 0$
Q.8-(A)	Check whether the lines $4x - 3y - 8 = 0$; $3x - 4y - 6 = 0$ and $x - y - 2 = 0$ are concurrent. If so , find the point where they meet
(B)	Find the equations of tangents drawn from point (0, 5) to the circle $x^2 + y^2 = 16$
Q.9-(A)	Show that an equation of parabola with focus at $(a\cos\alpha , a\sin\alpha)$ and directrix $x\cos\alpha + y\sin\alpha + a = 0$ is $(x\sin\alpha - y\cos\alpha)^2 = 4a(x\cos\alpha + y\sin\alpha)$
(B)	Find area of the triangle with vertices A (1, -1 , 1) , B (2, 1, -1) and C (-1, 1,2)

PAPER CODE - 8191
(12th CLASS - 12018)

MATHEMATICS , GROUP FIRST TIME: 30 MINUTES , MARKS: 20

OBJECTIVE

NOTE: You have four choices for each objective type question as A , B , C and D . The choice which you think is correct , fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

QUESTION NO. 1

(1) If $f(x) = \sqrt{x+4}$, then $f(4) =$ (A) 8 (B) 16 (C) $\sqrt{2}$ (D) $2\sqrt{2}$

(2) If $f(x) = -2x + 6$, then $f^{-1}(x) =$ (A) $6 - 2x$ (B) $\frac{6-x}{2}$ (C) $\frac{2}{6-x}$ (D) $2x - 6$

(3) $\frac{d}{dx}[g(x)]^{-1} =$ (A) $-[g(x)]^{-2}$ (B) $-[g'(x)]^{-2}$ (C) $-g'(x)[g(x)]^{-2}$ (D) $\frac{-g(x)}{[g(x)]^2}$

(4) $\frac{d}{dx}(\text{Cosec } x) =$ (A) $-\text{Cosec}^2 x$ (B) $-\text{Cosec } x \text{ Cot } x$ (C) $-\text{Cosec}^2 x \text{ Cot } x$ (D) $-\text{Cot}^2 x$

(5) $\frac{d}{dx}(a^{\sqrt{x}}) =$ (A) $a^{\sqrt{x}}.\ln a$ (B) $\frac{a^{\sqrt{x}}}{\ln a}$ (C) $\frac{a^{\sqrt{x}}.\ln a}{2\sqrt{x}}$ (D) $\frac{a^{\sqrt{x}}}{2\sqrt{x}\ln a}$

(6) Geometrically $\frac{dy}{dx}$ means
(A) Tangent of slope (B) Slope of tangent (C) Slope of line (D) Slope of x-axis

(7) If $V = x^3$, then differential of V is (A) $3x^2\,dx$ (B) $3x^2$ (C) $x^3\,dx$ (D) $3x^2\,dv$

(8) $\int (x^2+3x)\,dx =$ (A) $\frac{x^3}{3} + \frac{3x^2}{2} + c$ (B) $x^2 + 3x + c$ (C) $2x+3+c$ (D) $2x+3$

(9) $\int \text{Sin } x\,dx =$ (A) Cos x (B) Cos x+c (C) - Cos x+c (D) $\frac{\text{Sin}^2 x}{2} + c$

(10) $\int (m+1)[x^2+2x]^m (2x+2)\,dx =$
(A) $(x^2+2x)^{m+1}+c$ (B) $\frac{(x^2+2x)^{m+1}}{m+1}+c$ (C) $(x^2+2x)^{m-1}+c$ (D) $m(x^2+2x)^{m-1}+c$

(11) The distance of the point (3,7) from x-axis is (A) 7 (B) 3 (C) – 3 (D) -7

(12) If the distance of the point (5,x) from x-axis is 3 , then x =
(A) 7 (B) 5 (C) 3 (D) - 5

(13) If (3,5) is the midpoint of (5,y) , (x ,7) then x = ? and y = ?
(A) y = 1 , x = 1 (B) y = - 4 , x = - 3 (C) y = 3 , x = 1 (D) y = - 2 , x = -5

(14) The slope of line with inclination 60° is (A) 0 (B) $\frac{1}{\sqrt{3}}$ (C) 1 (D) $\sqrt{3}$

(15) $2x - 8 \leq 0$ is (A) equation (B) identity (C) inequality (D) curve

(16) The radius of circle $(x - 5)^2 + (y - 3)^2 = 8$ is (A) 64 (B) 4 (C) $2\sqrt{2}$ (D) 2

(17) The line $y = mx + c$ is tangent to the parabola $y^2 = 4ax$ if c = ?
(A) $\frac{m}{a}$ (B) $\frac{-b}{a}$ (C) $\frac{a}{m}$ (D) $\frac{1}{ma}$

(18) The foci of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ are
(A) (± a , 0) (B) (0 , ± a) (C) (0 , ± ae) (D) (± ae , 0)

(19) The angle between the vectors $2\hat{i} + 3\hat{j} + \hat{k}$ and $2\hat{i} - \hat{j} - \hat{k}$ is
(A) 30° (B) 45° (C) 60° (D) 90°

(20) If the vectors $2\alpha\,\hat{i} + \hat{j} - \hat{k}$ and $\hat{i} + \alpha\,\hat{j} + 4\hat{k}$ are perpendicular to each other , then value of " α " is
(A) 3 (B) $\frac{1}{3}$ (C) $\frac{2}{3}$ (D) $\frac{4}{3}$

DG Khan Board-2018

QUESTION NO. 2 Write short answers any Eight (8) questions of the following 16

1	Express the volume " V " of a cube as a function of the area " A " of its base
2	Determine whether the function f is even or odd $f(x) = x^3 + x$
3	$\lim_{\theta \to 0} \frac{\sin\theta}{\pi - \theta}$ and θ in radian
4	Differentiate $\frac{2x-3}{2x+1}$ w.r.t. x.
5	If $x = 1 - t^2$ and $y = 3t^2 - 2t^3$, then find $\frac{dx}{dt}$ and $\frac{dy}{dt}$
6	Find $\frac{dy}{dx}$ if $y = (3x^2 - 2x + 7)^6$
7	Differentiate $(1+x^2)^n$ w.r.t. x^2
8	Show that $\frac{d}{dx}(\text{Cosec}^{-1}x) = \frac{-1}{x\sqrt{x^2-1}}$, for $x > 1$
9	Differentiate $\text{Sin}^{-1}\sqrt{1-x^2}$ w.r.t.x
10	Find $\frac{dy}{dx}$ if $y = xe^{\sin x}$
11	Find y_4 if $y = \text{Cos}^3 x$
12	Apply Maclaurin series expansion to prove that $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots\ldots$

QUESTION NO. 3 Write short answers any Eight (8) questions of the following 16

1	Evaluate $\int \frac{\sin x + \cos^3 x}{\cos^2 x \sin x}\, dx$
2	Evaluate $\int \frac{1-x^2}{1+x^2}\, dx$
3	Evaluate $\int \frac{\cot\sqrt{x}}{\sqrt{x}}\, dx$
4	Evaluate $\int \frac{1}{(1+x^2)^{3/2}}\, dx$
5	Evaluate $\int x^4 \ln x\, dx$
6	Evaluate $\int e^x (\cos x + \sin x)\, dx$
7	Evaluate $\int_1^{\sqrt{5}} \sqrt{(2t-1)^3}\, dt$
8	Solve the differential equation $\sec x + \tan y \frac{dy}{dx} = 0$
9	Find area between x-axis and the curve $y = \cos\frac{x}{2}$: $x = -\pi$ to π
10	Evaluate $\int \frac{1}{\sqrt{a^2+x^2}}\, dx$
11	Define Convex Region
12	Indicate the solution set for $3x + 7y \geq 21$, $x - y \leq 2$

QUESTION NO. 4 Write short answers any Nine (9) questions of the following 18

1	Find h So that the points $A(\sqrt{3}, -1)$ B(0 , 2) and C(h , - 2) are collinear
2	Find the slope and inclination of the line joining the points (3 , - 2) and (2 , 7)
3	Find an equation of the line through (- 4 , - 6) and perpendicular to a line having slope -3/2
4	Find whether the point (5 , 8) lies above or below the line $2x - 3y + 6 = 0$
5	Find the measure of the angle between the two lines , $2x^2 + 3xy - 5y^2 = 0$
6	Find the focus and vertex of the parabola $y^2 = 8x$
7	Find an equation of the parabola with Focus (- 3 , 1) and directrix $x = 3$
8	Find an equation of the ellipse having centre at (0 , 0) , focus at (0 , - 3) and one vertex at (0 , 4)
9	Find the foci and vertices of ellipse $25x^2 + 9y^2 = 225$
10	Find the angle between the vectors $\underline{u} = 2\underline{i} - \underline{j} + \underline{k}$ and $\underline{V} = -\underline{i} + \underline{j}$
11	Prove that $\cos(\alpha + \beta) = \cos\alpha \cos\beta - \sin\alpha \sin\beta$
12	Find a vector perpendicular to each of the vectors $\underline{a} = 2\underline{i} + \underline{j} + \underline{k}$ and $\underline{b} = 4\underline{i} + 2\underline{j} - \underline{k}$
13	Find the value of $2\underline{i} \times 2\underline{j} \cdot \underline{k}$

SECTION-II

Note: Attempt any Three questions from this section **10 x 3 = 30**

5-(A)	If $f(x) = \begin{cases} \frac{\sqrt{2x+5}-\sqrt{x+7}}{x-2} & , \quad x \neq 2 \\ k & , \quad x = 2 \end{cases}$ find value of k so that "f" is continuous at $x = 2$
(B)	Show that $2^{x+h} = 2^x [1+(\ln 2)h+(\ln 2)^2 \frac{h^2}{2!} + (\ln 2)^3 \frac{h^3}{3!} + \ldots\ldots\ldots]$
6-(A)	Evaluate the integral $\int \text{Cosec}^3 x.\ dx$
(B)	Find the equations of two parallel lines perpendicular to $2x - y + 3 = 0$ such that the product of x – and y – intercepts of each is 3
7-(A)	Evaluate $\int_0^3 \frac{dx}{x^2+9}$
(B)	Minimize $Z = 3x + y$ subject to the constraints $3x + 5y \geq 15$, $x + 6y \geq 9$, $x \geq 0$, $y \geq 0$
8-(A)	Show that the circles $x^2 + y^2 + 2x - 2y - 7 = 0$ and $x^2 + y^2 - 6x + 4y - 9 = 0$ touch externally
(B)	Prove that in any triangle Δ ABC $a^2 = b^7 + c^2 - 2bc\ \text{Cos}\ A$
9-(A)	Find equation of the hyperbola with centre (0,0) focus (6,0) Vertex (4,0)
(B)	Prove that the points whose position vectors are $A(-6\underline{i} + 3\underline{j} + 2\underline{k})$, $B(3\underline{i} - 2\underline{j} + 4\underline{k})$, $C(-5\underline{i} + 7\underline{j} + 3\underline{k})$, $D(-13\underline{i} + 17\underline{j} - \underline{k})$ are coplanar

PAPER CODE - 8192

(12th CLASS - 12018)

MATHEMATICS , GROUP SECOND TIME: 30 MINUTES , MARKS: 20

OBJECTIVE

NOTE: You have four choices for each objective type question as A , B , C and D . The choice which you think is correct , fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

QUESTION NO. 1

(1) Domain of $f(x)=\frac{x-1}{x-4}$ is (A) 4 (B) 1 (C) R-{1} (D) R-{4}

(2) $\lim_{x\to 0} \frac{\sin ax}{\sin bx}$ (A) $\frac{a}{b}$ (B) $\frac{b}{a}$ (C) ab (D) - ab

(3) $\frac{d}{dx}(e^{x^2+1}) =$ (A) $2e^{x^2+1}$ (B) $2xe^{x^2+1}$ (C) e^{x^2+1} (D) xe^{x^2+1}

(4) $\frac{d}{dx}(\tan^{-1} 4x) =$ (A) $\frac{-1}{1+16x^2}$ (B) $\frac{4}{1+16x^2}$ (C) $\frac{1}{1+16x^2}$ (D) $\frac{-4}{1+16x^2}$

(5) $\frac{d}{dx}(\sin h^{-1} x) =$ (A) $\frac{1}{\sqrt{1-x^2}}$ (B) $\frac{-1}{\sqrt{1-x^2}}$ (C) $\frac{-1}{\sqrt{1+x^2}}$ (D) $\frac{1}{\sqrt{1+x^2}}$

(6) $Y = e^{2x}$, $Y_4 =$ (A) $8e^{2x}$ (B) $16e^{2x}$ (C) e^{8x} (D) e^{16x}

(7) $\int e^{2x}(-\sin x + 2\cos x)dx =$ (A) $e^{2x}\cos x + C$ (B) $e^{2x}\sin x + C$ (C) $-e^{2x}\cos x + C$ (D) $2e^{2x}\cos x + C$

(8) $\int_0^{\pi} \sin x\, dx =$ (A) 1 (B) 0 (C) 2 (D) π

(9) $\int_0^{\pi/4} \sec^2 x\, dx =$ (A) 3 (B) 4 (C) 2 (D) 1

(10) $\int_0^{1/\sqrt{2}} \frac{dx}{\sqrt{1-x^2}} =$ (A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) π

(11) Distance between the points (2,3) and (3,2) is (A) $\sqrt{2}$ (B) 2 (C) 1 (D) $2\sqrt{5}$

(12) Slope –intercept form of straight line is (A) x =0 (B) $\frac{x}{a}+\frac{y}{b}=1$ (C) y = mx +c (D) y = 0

(13) The slope of line –ax + by –c = 0 is (A) $\frac{a}{b}$ (B) $\frac{-a}{b}$ (C) $\frac{b}{a}$ (D) $\frac{a}{c}$

(14) The point of intersection of medians of a triangle is (A) centroid (B) orthocenter (C) circumference (D) incenter

(15) Solution of inequality $x+2y<6$ is (A) (1,3) (B) (1,1) (C) (1,4) (D) (1,5)

(16) The radius of the circle $x^2+y^2+2gx+2fy+c=0$ is

(A) $\sqrt{g^2+f^2+C}$ (B) $\sqrt{g^2-f^2+C}$ (C) $\sqrt{g^2-f^2-C}$ (D) $\sqrt{g^2+f^2-C}$

(17) The length of the diameter of the circle $x^2+y^2=a^2$ is (A) 1 (B) 2 (C) 2a (D) a

(18) If a circle and a line intersect in two points, then the line is called (A) chord (B) secant (C) radius (D) diameter

(19) If $\underline{V} = -\underline{i} - 2\underline{j} - 3\underline{k}$, then $|\underline{V}| =$ (A) $-\sqrt{6}$ (B) -14 (C) $\sqrt{14}$ (D) 6

(20) If $\overrightarrow{OA}=\vec{a}$, $\overrightarrow{OB}=\vec{b}$ then $\overrightarrow{AB}$ is (A) $\vec{a}+\vec{b}$ (B) $\vec{a}.\vec{b}$ (C) $\vec{a}-\vec{b}$ (D) $\vec{b}-\vec{a}$

MATHEMATICS , GROUP SECOND | 12th CLASS - 12018 | TIME : 2.30 HOURS

SUBJECTIVE | MARKS : 80

SECTION-I

QUESTION NO. 2 Write short answers any Eight (8) questions of the following 16

1	Express the perimeter " P " of square as a function of its area , "A".
2	Evaluate $\lim_{x \to 0} \frac{\sin ax}{\sin bx}$
3	Give the criterion for Existence of limit of a function
4	Give the definition of Derivative of function $f(x)$
5	Find the derivative of $y = (x^2 + 5)(x^3 + 7)$ w.r.t. x
6	If $y = \sqrt{x + \sqrt{x}}$ find $\frac{dy}{dx}$ by making suitable substitution.
7	Differentiate Sin x w.r.t. cot x.
8	Find $f'(x)$ if $f(x) = \ln (e^x + e^{-x})$
9	Find $\frac{dy}{dx}$, if $y = \sin h^{-1} (x^3)$
10	Find y_2 if $y = \sqrt{x} + \frac{1}{\sqrt{x}}$
11	Define increasing and decreasing functions.
12	Find extreme values of $f(x) = 5x^2 - 6x + 2$

QUESTION NO. 3 Write short answers any Eight (8) questions of the following 16

1	Find the approximate increase in the volume of a cube if the length of its each edge changes from 5 to 5.02
2	Using differential find $\frac{dy}{dx}$ when $x^4 + y^2 = xy^2$
3	Evaluate $\int \frac{(1+e^x)^3}{e^x} dx$
4	Evaluate $\int \frac{ax+b}{ax^2+2bx+c} dx$
5	Evaluate $\int \frac{\cot\sqrt{x}}{\sqrt{x}} dx \quad x > 0$
6	Evaluate $\int \frac{\sin\theta}{1+\cos^2\theta} d\theta$
7	Evaluate $\int x^4 \ln x \, dx$
8	Evaluate $\int_0^{\pi/6} x \cos x \, dx$
9	Evaluate $\int_1^2 \frac{x}{x^2+2} dx$
10	Find the area bounded by"cos" function from $x = -\pi/2$ to $x = \pi/2$
11	Graph the solution set of linear inequality $3x + 7y \geq 21$
12	Define a "corner point"

QUESTION NO. 4 Write short answers any Nine (9) questions of the following 18

1	The points A (-5 , -2) , B (5, - 4) are end points of the diameter of circle. Find the centre and radius of circle
2	By means of slopes, show that following points lie on the same line.(-4,6);(3,8);(10,10)
3	Find an equation of the vertical line through (- 5 , 3)
4	Convert into two –intercept form $4x + 7y - 2 = 0$
5	Find point of intersection of the lines $3x + y + 12 = 0$ and $x + 2y - 1 = 0$
6	Find the focus and the vertex of the parabola $x^2 = 5y$
7	Write an equation of parabola with Focus (-3,1); directrix $x = 3$
8	Find an equation of the ellipse with foci (±3,0) and length of minor axis 10 .
9	Find center and foci of the ellipse $x^2 + 4y^2 = 16$
10	Find the unit vector in the same direction as the vector $\underline{V} = [-2,4]$
11	Find " $\propto$ ", so that $\lvert \propto \underline{i} + (\propto+1)\underline{j} + 2\underline{k} \rvert = 3$
12	Find a vector whose magnitude is 4 and is parallel to $2\underline{i} - 3\underline{j} + 6\underline{k}$
13	Find magnitude of the vector $\underline{V}$ and write the direction cosines of $\underline{V}$ where $\underline{V} = 2\underline{i} + 3\underline{j} + 4\underline{k}$

SECTION-II

Note: Attempt any Three questions from this section **10 x 3 = 30**

5-(A)	Find the value of k. If the function $f(x) = \begin{cases} \frac{\sqrt{2x+5}-\sqrt{x+7}}{x-2} & , x \neq 2 \\ K & , x = 2 \end{cases}$ is continuous at $x = 2$
(B)	Expand a^x in the Maclaurin series expansion upto 4-terms.
6-(A)	Evaluate the integral $\int \frac{x \sin^{-1}x}{\sqrt{1-x^2}}\, dx$
(B)	The point A(-1,2) , B(6,3) and C(2,-4) are vertices of a triangle. Show that the line joining the midpoint D of $\overline{AB}$ and the midpoint E of $\overline{AC}$ is parallel to $\overline{BC}$ and $\overline{DE} = \frac{1}{2}\overline{BC}$
7-(A)	Evaluate $\int_0^{\pi/6} x \cos x \, dx$
(B)	Maximize $f(x,y) = 2x + 5y$, Subject to the constraints $2y - x \leq 8$ $x - y \leq 4$, $x \geq 0$, $y \geq 0$
8-(A)	Show that the circles $x^2+y^2 + 2x - 2y - 7 = 0$ and $x^2+y^2 - 6x + 4y + 9 = 0$ touch externally
(B)	Show that the vectors $2\underline{i} - \underline{j} + \underline{k}$, $\underline{i} - 3\underline{j} - 5\underline{k}$ and $3\underline{i} - 4\underline{j} - 4\underline{k}$ form sides of a right triangle.
9-(A)	Find an equation of Hyperbola with given data Foci $(2 \pm 5\sqrt{2}, -7)$,length of transverse axis 10.
(B)	In any triangle ABC , Prove that $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$