

MATHEMATICS

Class 12th (Inter Part-II) — Group-I — For All Sessions

PART - I (OBJECTIVE)

Time: 30 Minutes

Total Questions: 20

Marks: 20

Note: Write answers to the questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with marker or pen ink on the answer sheet provided.

- 1 Midpoint of $A(2, 0)$, $B(0, 2)$ is:
(A) $(0, 2)$ (B) $(2, 0)$ (C) $(2, 2)$ (D) $(1, 1)$
- 2 The ____ point satisfies $x + 2y < 6$
(A) $(4, 1)$ (B) $(3, 1)$ (C) $(1, 3)$ (D) $(1, 4)$
- 3 In a conic, the ratio of the distance from a fixed point to the distance from a fixed line is:
(A) Focus (B) Vertex (C) Eccentricity (D) Centre
- 4 Standard equation of Parabola is:
(A) $y^2 = 4ax$ (B) $x^2 + y^2 = a^2$
(C) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ (D) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
- 5 Equation of tangent to circle $x^2 + y^2 = a^2$ at $P(x_1, y_1)$ is:
(A) $xx_1 + yy_1 = a^2$ (B) $xx_1 - yy_1 = a^2$
(C) $xy_1 + yx_1 = a^2$ (D) $xy_1 - yx_1 = a^2$
- 6 The volume of parallelepiped = ____.
(A) $(\underline{u} \times \underline{v}) \cdot \underline{w}$ (B) $(\underline{u} \times \underline{v}) \times \underline{w}$
(C) $\underline{u} \times (\underline{v} \times \underline{w})$ (D) $\underline{u} \times (\underline{u} \times \underline{v})$
- 7 The non-zero vectors are perpendicular when:
(A) $\underline{u} \cdot \underline{v} = 1$ (B) $|\underline{u} \cdot \underline{v}| = 1$ (C) $\underline{u} \cdot \underline{v} = 0$ (D) $\underline{u} \cdot \underline{v} \neq 0$
- 8 $\underline{j} \times \underline{k} =$ ____.
(A) $\underline{i}$ (B) $-\underline{i}$ (C) 0 (D) $\underline{k}$
- 9 The range of $f(x) = 2 + \sqrt{x - 1}$ is:
(A) $[1, +\infty)$ (B) $[2, +\infty)$ (C) $(1, +\infty)$ (D) $(2, +\infty)$
- 10 The perimeter P of square as a function of its area A:
(A) $3\sqrt{A}$ (B) $4\sqrt{A}$ (C) $\sqrt{A}$ (D) $2\sqrt{A}$
- 11 If $f(x) = \frac{1}{x^2}$ then $f'(3) =$ ____.
(A) $\frac{1}{9}$ (B) $-\frac{2}{3}$
(C) $-\frac{2}{27}$ (D) $\frac{1}{27}$
- 12 If $f(c) = 0$ & $f'(c) > 0$ then C is point of:
(A) Maxima (B) Minima (C) Inflection (D) Constant
- 13 $\frac{d}{dx} (\log_a x) =$ ____.
(A) $\frac{1}{x \ln a}$ (B) $\frac{\ln a}{x}$
(C) $\frac{1}{x}$ (D) $\frac{-1}{x \ln a}$
- 14 $\frac{d}{dx} (\cot ax) =$ ____.
(A) $\operatorname{cosec}^2 ax$ (B) $a \operatorname{cosec}^2 ax$
(C) $-a \operatorname{cosec}^2 ax$ (D) $-a \operatorname{cosec} ax$
- 15 $\int \frac{1}{\sqrt{1-x^2}} dx =$ ____.
(A) $\sin^{-1} x + c$ (B) $\cos^{-1} x + c$
(C) $-\sin^{-1} x + c$ (D) $-\cos^{-1} x + c$
- 16 $\int \frac{1}{x} dx =$ ____.
(A) $\ln x + c$ (B) $\frac{1}{x^2} + c$
(C) $-\frac{1}{x^2} + c$ (D) $\frac{1}{x} + c$
- 17 The solution of differential equation $\frac{dy}{dx} = -y$ is:
(A) $y = xe^{-x}$ (B) $y = ce^{-x}$
(C) $y = e^x$ (D) $y = ce^x$

18	$\int_0^1 \frac{1}{1+x^2} dx = \underline{\hspace{1cm}}.$		
(A) $\frac{\pi}{4}$	(B) $\frac{2\pi}{3}$		
(C) $\frac{3\pi}{4}$	(D) π		
19	x - intercept of the line $2x + 5y - 1 = 0$ is:		
(A) 2	(B) 3		
(C) $\frac{1}{2}$	(D) $\frac{1}{5}$		
20	Slope of y - axis is:		
(A) 0	(B) 1	(C) -1	(D) <i>Undefined</i>

MATHEMATICS

Class 12th (Inter Part-II) — Group-I — For All Sessions

PART - II (SUBJECTIVE)

Time: 2:30 hours

Marks: 80

SECTION - I

2. Write short answers of any eight parts from the following:

(8 × 2 = 16)

- If $f(x) = 2x + 1$, then find $f \circ f(x)$.
- Express the area A of a circle as a function of its circumference C .
- Evaluate $\lim_{h \rightarrow 0} \frac{\sqrt{x+h} - \sqrt{x}}{h}$
- Define continuous function.
- Differentiate $(\sqrt{x} - \frac{1}{\sqrt{x}})^2$ w.r.t x
- Find $\frac{dy}{dx}$ if $y^2 - xy - x^2 + 4 = 0$
- Differentiate $x^2 \sec 4x$ w.r.t x
- Differentiate $\sin^2 x$ w.r.t. $\cos^4 x$
- Find $f'(x)$ if $f(x) = e^x(1 + \ln x)$
- Find y_2 if $y = \ln(x^2 - 9)$
- Prove that $\ln(1 + x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$
- Determine the interval in which $f(x) = \cos x$ is decreasing; $x \in (-\frac{\pi}{2}, \frac{\pi}{2})$.

3. Write short answers of any eight parts from the following:

(8 × 2 = 16)

- Solve the differential equation $\sec^2 x \tan y \, dx + \sec^2 y \tan x \, dy = 0$
- Find the area between x -axis and the curve $y = x^2 + 1$ from $x = 1$ to $x = 2$
- Evaluate: $\int_1^e x \ln x \, dx$
- Evaluate the integral $\int \frac{-2x}{\sqrt{4-x^2}} \, dx$
- Evaluate: $\int (\sqrt{x} - \frac{1}{\sqrt{x}})^2 \, dx$
- Evaluate the integral $\int (a + 2x)^{3/2} \, dx$
- Find the approximate change in the volume of a cube if length of its each edge changes from 5 to 5.02.
- Show that the points $A(0, 2)$, $B(\sqrt{3}, -1)$ and $C(0, -2)$ are vertices of a right triangle.
- Convert the equation of line $4x + 7y - 2 = 0$ into normal form.
- Find the angle from the line with slope $-\frac{7}{3}$ to the line with slope $\frac{5}{2}$.
- Find the pair of lines represented by $3x^2 + 7xy + 2y^2 = 0$.
- Find the point of intersection of lines $3x + y + 12 = 0$ and $x + 2y - 1 = 0$.

4. Write short answers of any nine parts from the following:

(9 × 2 = 18)

- Define feasible region.
- Graph the solution set of in-equality $3x + 7y \geq 21$.
- Find equation of circle with ends of diameter at $(-3, 2)$ and $(5, -6)$.
- Write down equation of tangent to the circle $x^2 + y^2 = 25$ at $(5 \cos \theta, 5 \sin \theta)$
- Find focus and vertex of Parabola $x^2 = 4(y - 1)$
- Find equation of ellipse with data Foci $(\pm 3, 0)$ Minor axis of length 10.
- Find center of hyperbola $x^2 - y^2 + 8x - 2y - 10 = 0$
- Find equation of Normal to $y^2 = 4ax$ at $(at^2, 2at)$.
- Find the sum of vector $\overrightarrow{AB}$ and $\overrightarrow{CD}$ given four points $A(1, -1)$ $B(2, 0)$ $C(-1, 3)$ and $D(-2, 2)$
- Find α , so that $|\alpha \hat{i} + (\alpha + 1)\hat{j} + 2\hat{k}| = 3$
- If $\underline{v}$ is a vector for which $\underline{v} \cdot \hat{i} = 0$, $\underline{v} \cdot \hat{j} = 0$, $\underline{v} \cdot \hat{k} = 0$, find $\underline{v}$
- Find the area of triangle determined by the points $P(0, 0, 0)$, $Q(2, 3, 2)$ and $R(-1, 1, 4)$
- Find the value of $2\hat{i} \times 2\hat{j} \cdot \hat{k}$

SECTION - II

Note: Attempt any three questions. Each question carries equal marks:

(10 × 3 = 30)

- Find the values of m and n , so that given function f is continuous at $x = 3$ when $f(x) = \begin{cases} mx, & \text{if } x < 3 \\ n, & \text{if } x = 3 \\ -2x + 9, & \text{if } x > 3 \end{cases}$ (05)
- Find $\frac{dy}{dx}$, when $x = \frac{a(1-t^2)}{1+t^2}$, $y = \frac{2bt}{1+t^2}$ (05)
- If $y = (\cos^{-1} x)^2$, prove that $(1 - x^2)y_2 - xy_1 - 2 = 0$. (05)
- Evaluate the integral $\int e^x \sin x \cos x \, dx$. (05)
- Solve the differential equation $y - x \frac{dy}{dx} = 3(1 + x \frac{dy}{dx})$. (05)

- (b)** Graph the feasible region and corner points of the inequalities $2x + y \leq 10$; $x + 4y \leq 12$; $x + 2y \leq 10$;
8. (05)
- (a)** Show that the circles: $x^2 + y^2 + 2x - 8 = 0$; $x^2 + y^2 - 6x + 6y - 46 = 0$ touch internally.
(b) Using vector method, for any triangle ABC, prove that: $c^2 = a^2 + b^2 - 2ab \cos C$. (05)
- 9.** (05)
- (a)** Find the focus, vertex and directrix of the Parabola; $x^2 = 4(y - 1)$
- (b)** Find the lines represented by $3x^2 + 7xy + 2y^2 = 0$ and also find measure of the angle between them. (05)

Original board paper reference: 618-12-A | Typeset by Tayarri from the 2024 Rawalpindi Board paper. Part-numbering in Q4 is as printed on the source (the board repeats "xii"). The operator in Q3(vi) is smudged on the scan and is shown as a plus sign; verify before use. No answer key included.