

MATHEMATICS

Class 12th (Inter Part-II) — Group-II — 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 If $r = 0$, the circle is called:
(A) Unit circle (B) Circle (C) Ellipse (D) Point circle
- 2 $[i \ i \ k] =$
(A) i (B) $-i$ (C) 1 (D) 0
- 3 If $\underline{u} = 2\hat{i} - \hat{j} + \hat{k}$, $\underline{v} = 4\hat{i} + 2\hat{j} - \hat{k}$ then $\underline{u} \times \underline{v} =$
(A) $\underline{u}^2$ (B) 0 (C) 1 (D) 2
- 4 If $\underline{u}$, $\underline{v}$ are two non-zero vectors, then area of parallelogram =
(A) $|\underline{u} \times \underline{v}|$ (B) $\frac{1}{2}|\underline{u} \times \underline{v}|$
(C) $\frac{1}{6}|\underline{u} \times \underline{v}|$ (D) $\frac{1}{2}(\underline{u} \times \underline{v})$
- 5 If k is any real number, $\lim_{x \rightarrow a}[kf(x)] =$
(A) $\lim_{x \rightarrow a} f(x)$ (B) $\lim_{x \rightarrow a} k$
(C) $k \lim_{x \rightarrow a} f(x)$ (D) $f(x)$
- 6 If $f(x) = x + 3$ then: $\lim_{x \rightarrow 3} f(x) =$
(A) 6 (B) 0 (C) -3 (D) 3
- 7 If $y = e^{f(x)}$ then $\frac{dy}{dx} =$
(A) $e^{f(x)}$ (B) $f(x)e^{f(x)}$
(C) $f(x)e^{f(x)}$ (D) $f'(x)e^{f(x)}$
- 8 Derivative of $x\sqrt{(x^2 + 3)}$ w.r.t x is:
(A) $\frac{2x^2 + 3}{\sqrt{(x^2 + 3)}}$ (B) $\frac{3x}{2\sqrt{(x^2 + 3)}}$
(C) $\frac{3x^2 + 3}{x\sqrt{(x^2 + 3)}}$ (D) $\frac{3x^2 + 3}{2x\sqrt{(x^2 + 3)}}$
- 9 Derivative of $\tanh(x^2)$ is:
(A) $2x \operatorname{sech}^2 x$ (B) $2 \operatorname{sech}^2 x^2$
(C) $2x \operatorname{sech}^2 x^2$ (D) $\operatorname{sech}^2 x^2$
- 10 Derivative of " x " w.r.t " x " is:
(A) x^2 (B) 2 (C) 0 (D) 1
- 11 In integration, substitution of $\sqrt{(4 - x^2)}$ is:
(A) $x = \sin\theta$ (B) $x = 2 \sin\theta$ (C) $x = \sin 2\theta$ (D) $x = 2 \cos\theta$
- 12 $\int \tan x \, dx =$
(A) $\ln \cos x + c$ (B) $\frac{1}{\ln \cos x} + c$
(C) $-\ln|\cos x| + c$ (D) $\sec^2 x + c$
- 13 Solution of differential equation: $(e^x + e^{-x}) \frac{dy}{dx} = e^x - e^{-x}$ is:
(A) $-\ln(e^x + e^{-x}) + c$ (B) $\ln(e^x - e^{-x}) + c$
(C) $\ln(e^x + e^{-x}) + c$ (D) $\frac{(e^x + e^{-x})^2}{2}$
- 14 $\int \sin x \cos x \, dx =$
(A) $\frac{\sin^2 x}{2} + c$ (B) $\frac{\cos^2 x}{2} + c$
(C) $-\sin x + c$ (D) $\cos x + c$
- 15 The line: $ay + b = 0$ is
(A) Parallel to y-axis (B) Parallel to x-axis (C) Passing through origin (D) Lies in Quad. I
- 16 The slope of line joining the points $(-2, 4)$; $(5, 11)$ is:
(A) 1 (B) -1 (C) 45° (D) -45°
- 17 The location of the plane of the point $P(x, y)$ for which $y = 0$ at:
(A) Origin (B) y - axis (C) x - axis (D) 1st Quad
- 18 The maximum and minimum values occur at:
(A) Corner point (B) Any point
(C) Convex region (D) Corner points of feasible region

19	The line intersect the circle at:			
	(A) One point	(B) Two points	(C) Infinite points	(D) More than two points
20	Diameter of circle: $x^2 + y^2 = 16$ is:			
	(A) 8	(B) 4	(C) 16	(D) 32

Original board paper reference: 619-12-A | Typeset by Tayarri from the 2024 Rawalpindi Board paper. Options (B) and (C) of Q7 print identically on the source scan; verify against the original before use. No answer key included.

MATHEMATICS

Class 12th (Inter Part-II) — Group-II — 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)

- Define even function with example.
- Find $f \circ g(x)$ if $f(x) = 2x + 1$, $g(x) = \frac{3}{x-1}$, $x \neq 1$.
- Evaluate: $\lim_{x \rightarrow 2} \frac{\sqrt{x} - \sqrt{2}}{x - 2}$.
- Prove that $\sinh 2x = 2 \sinh x \cosh x$.
- Find $\frac{dy}{dx}$ from first principles if $y = \frac{1}{\sqrt{x+a}}$.
- Differentiate w.r.t x ; $\frac{(x^2 + 1)^2}{x^2 - 1}$.
- Find $\frac{dy}{dx}$ if $x^2 - 4xy - 5y = 0$.
- Differentiate w.r.t θ ; $\tan^3 \theta \sec^2 \theta$.
- Find $f'(x)$ if $f(x) = x^3 e^{1/x}$.
- Find y_2 if $y = 2x^5 - 3x^4 + 4x^3 + x - 2$.
- Apply Maclaurin Series expansion to prove that: $\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$
- Find extreme values for $f(x) = 3x^2$.

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

(8 × 2 = 16)

- Evaluate $\int x \sqrt{x^2 - 1} dx$
- Use differentials to approximate the value of $(31)^{1/5}$
- Evaluate $\int \frac{x}{\sqrt{4+x^2}} dx$
- Evaluate the integral $\int \frac{e^{m \tan^{-1} x}}{1+x^2} dx$
- Evaluate: $\int_1^2 \frac{x}{x^2+2} dx$
- Find the area between x - axis and the curve $y = 4x - x^2$
- Solve the differential equation $\frac{1}{x} \frac{dy}{dx} = \frac{1}{2}(1+y^2)$
- The points $A(-5, -2)$ and $B(5, -4)$ are ends of a diameter of a circle. Find the centre and radius of circle.
- 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.
- Check whether the origin and the point $p(5, -8)$ lies on the same side or on the opposite sides of the line $3x + 7y + 15 = 0$
- By means of slopes, show that the following points lie on the same line $(-4, 6)$; $(3, 8)$; $(10, 10)$.
- Determine the value of p such that the lines $2x - 3y - 1 = 0$, $3x - y - 5 = 0$ and $3x + py + 8 = 0$ meet at a point.

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

(9 × 2 = 18)

- Graph the solution set of $3y - 4 \leq 0$ in xy - plane.
- Define convex region.
- Find an equation of circle of radius a and lying in the second quadrant tangent to both the axes.
- Find center and radius of circle $5x^2 + 5y^2 + 24x + 36y + 10 = 0$.
- Write down equation of normal to the circle $x^2 + y^2 = 25$ at $(4, 3)$.
- Find vertex and directrix of the parabola $y^2 = -12x$.
- Find the point of intersection of conics $x^2 + y^2 = 8$ and $x^2 - y^2 = 1$.
- Find center and foci of hyperbola $\frac{y^2}{4} - x^2 = 1$.
- Find a vector of magnitude 4 and is parallel to $2\mathbf{i} - 3\mathbf{j} + 6\mathbf{k}$.
- Find direction cosines of $\overline{PQ}$ where $P = (2, 1, 5)$ and $Q = (1, 3, 1)$.
- Find volume of parallelepiped whose edges are $\underline{u} = \mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$, $\underline{v} = 2\mathbf{i} - \mathbf{j} - \mathbf{k}$ and $\underline{w} = \mathbf{j} + \mathbf{k}$
- Find the value of $[\mathbf{k} \ \mathbf{i} \ \mathbf{j}]$.
- Find α so that $\underline{u} = \alpha\mathbf{i} + 2\alpha\mathbf{j} - \mathbf{k}$ and $\underline{v} = \mathbf{i} + \alpha\mathbf{j} + 3\mathbf{k}$ are perpendicular.

SECTION - II

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

(10 × 3 = 30)

- (a)** Evaluate: $\lim_{\theta \rightarrow 0} \frac{\tan \theta - \sin \theta}{\sin^3 \theta}$ (5)

(b) Differentiate $\cos \sqrt{x}$ from the first principle. (5)
- (a)** Show that $y = \frac{\ln x}{x}$ has maximum value at $x = e$ (5)

(b) Evaluate: $\int x^3 \cos x dx$ (5)

- 7.**
- (a) Evaluate: $\int_{\pi/6}^{\pi/2} \frac{\cos x \, dx}{\sin x (2 + \sin x)}$ (5)
- (b) Minimize $z = 2x + y$ subject to constraints $x + y \geq 3$, $7x + 5y \leq 35$, $x \geq 0$, $y \geq 0$ (5)
- 8.**
- (a) Find the coordinates of the points of intersection of the line $x + 2y = 6$ with the circle: $x^2 + y^2 - 2x - 2y - 39 = 0$ (5)
- (b) If $\underline{a} = 4\hat{i} + 3\hat{j} + \hat{k}$ and $\underline{b} = 2\hat{i} - \hat{j} + 2\hat{k}$. Find a unit vector perpendicular to both $\underline{a}$ and $\underline{b}$. Also find the sine of the angle between them. (5)
- 9.**
- (a) Find the focus, vertex and directrix of the Parabola $x + 8 - y^2 + 2y = 0$ (5)
- (b) Find coordinates of the circumcenter of the triangle whose vertices are $A(-2, 3)$, $B(-4, 1)$ and $C(3, 5)$. (5)