

Roll No. of Candidate _____

MATHEMATICS
Time: 30 Minutes

Intermediate Part-II, Class 12th (1st A 424-IV)
OBJECTIVE
Code: 8197 *GVJ-1-24*

GROUP: I
PAPER: II
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 of two or more circles will result in zero mark in that question.

- 1- 1- $\int \sec x \tan x \, dx = ?$
(A) $\sec x + c$ (B) $\sec^2 x + c$ (C) $\tan x + c$ (D) $\ln |\sec x + \tan x| + c$
- 2- The focus of parabola $x^2 = -16y$ is
(A) $(0, -4)$ (B) $(0, 0)$ (C) $(4, 0)$ (D) $(-4, 0)$
- 3- $\int_0^2 |x| \, dx$ is
(A) 0 (B) 1 (C) 2 (D) 4
- 4- Derivative of $y = f(x)$ at $x = a$ represents slope of
(A) tangent line at $x = a$ (B) secant line (C) perpendicular line (D) straight line
- 5- Projection of vector \underline{v} along vector \underline{u} is
(A) $\frac{\underline{u} \cdot \underline{v}}{|\underline{u}|}$ (B) $\frac{\underline{u} \cdot \underline{v}}{|\underline{v}|}$ (C) $\frac{\underline{u} \cdot \underline{u}}{|\underline{u}|}$ (D) $\frac{\underline{v} \cdot \underline{v}}{|\underline{v}|}$
- 6- Which one is true?
(A) $\underline{i} \times \underline{i} = \underline{i}$ (B) $\underline{i} \cdot \underline{i} = \underline{i}$ (C) $\underline{k} \times \underline{k} = \underline{v}$ (D) $\underline{k} \times \underline{i} = -\underline{j}$
- 7- Which one equation represents a circle?
(A) $y^2 = 8x$ (B) $3x^2 + 3y^2 = 9$ (C) $3x^2 + 5y^2 = 9$ (D) $x^2 - 2y = 0$
- 8- Which one is point-slope form of a straight line?
(A) $y = mx + c$ (B) $y - y_1 = m(x - x_1)$ (C) $\frac{x}{a} + \frac{y}{b} = 1$ (D) $\frac{x}{a} - \frac{y}{b} = 1$
- 9- Order of differential equation $\frac{d^2 y}{dx^2} + \frac{dy}{dx} - 2x = 6$ is
(A) 1 (B) 0 (C) 2 (D) 3
- 10- The interval in which $f(x) = 4 - x^2$; $x \in (-2, 2)$ is increasing
(A) $(0, 2)$ (B) $(-2, 0)$ (C) $(-2, 2)$ (D) $(0, 1)$
- 11- The function $f(x) = \frac{x^2 - 1}{x - 1}$ is not defined at
(A) $x = 0$ (B) $x = 1$ (C) $x = 2$ (D) $x = -1$
- 12- If $f(x) = x^{2/3}$, the $f'(8)$ is
(A) 3 (B) $\frac{1}{3}$ (C) $\frac{2}{3}$ (D) $\frac{1}{2}$
- 13- $\int \frac{f'(x)}{f(x)} \, dx = ?$
(A) $\ln |x| + c$ (B) $3 \ln |f(x)| + c$ (C) $\ln |f'(x)| + c$ (D) $\ln f(x) \cdot f'(x) + c$
- 14- Slope of the line passing through the points $(0, -1)$ and $(7, -15)$ is
(A) 2 (B) 0 (C) 1 (D) -2
- 15- $\lim_{x \rightarrow \infty} (e^x) = ?$
(A) ∞ (B) $-\infty$ (C) 1 (D) 0
- 16- $[\underline{u} \cdot \underline{v}] = ?$
(A) 1 (B) -1 (C) 0 (D) \underline{v}
- 17- Which point is not solution of inequality $x - 2y \leq 6$
(A) $(1, 1)$ (B) $(0, -1)$ (C) $(14, 0)$ (D) $(-4, 0)$
- 18- Major axis of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ with $(a > b)$ is
(A) $x = 0$ (B) $y = 0$ (C) $x = 1$ (D) $y = 1$
- 19- Derivative of $\tan^{-1} x$ w.r.t. x is
(A) $\frac{1}{1-x^2}$ (B) $\frac{1}{x^2-1}$ (C) $\frac{1}{1+x^2}$ (D) $1+x^2$
- 20- Distance of line $5x + 12y + 39 = 0$ from origin is
(A) 3 (B) 5 (C) 12 (D) 39

Note: Section I is compulsory. Attempt any three (3) questions from Section II.

SECTION I

2. Write short answers to any EIGHT questions:

(2 x 8 = 16)

- i- Let $f(x) = x^2 - x$, find the value of $f(x - 1)$.
- ii- State the domain and range of f^{-1} if $f(x) = \frac{1}{x+3}$
- iii- Evaluate $\lim_{x \rightarrow \pi} \frac{\sin x}{\pi - x}$
- iv- Express $\lim_{n \rightarrow \infty} \left(1 + \frac{3}{n}\right)^{2n}$ in term of e.
- v- Differentiate $\frac{x^2+1}{x^2-3}$ w.r.t. 'x'
- vi- Find $\frac{dy}{dx}$ if $x = at^2$ and $y = 2at$
- vii- Prove that $\frac{d}{dx}(\cot^{-1} x) = \frac{-1}{1+x^2}$
- viii- Differentiate $(\cos \sqrt{x} + \sqrt{\sin x})$ w.r.t 'x'
- ix- Find $\frac{dy}{dx}$ if $y = \sin h^{-1}(ax + b)$
- x- Find $\frac{dy}{dx}$ if $y = \log_{10}(ax^2 + bx + c)$
- xi- Find $f'(x)$ if $f(x) = \frac{e^x}{e^{-x} + 1}$
- xii- Define a stationary point.

3. Write short answers to any EIGHT questions:

(2 x 8 = 16)

- i- Use differential to find $\frac{dy}{dx}$, if $xy - \ln x = c$
- ii- Evaluate $\int \frac{(1-\sqrt{x})^2}{\sqrt{x}} dx$, ($x > 0$)
- iii- Find $\int \sec x dx$
- iv- Integrate $\int \sin^{-1} x dx$
- v- Evaluate $\int e^x (\cos x - \sin x) dx$
- vi- Calculate $\int_1^2 \frac{x}{x^2+2} dx$
- vii- Solve the differential equation $\frac{dy}{dx} = \frac{1-x}{y}$
- viii- Find an equation of vertical line through $(-5, 3)$.
- ix- Write the equation of line in two intercepts form.
- x- Convert $15y - 8x + 3 = 0$ in slope intercept form.
- xi- Find the equation of line passing through $A(-6, 5)$ having slope 7.
- xii- Show that the points $A(-1, 2)$, $B(7, 5)$ and $C(2, -6)$ are vertices of right triangle.

(Turn over)

(2)

(2 x 9 = 18)

4. Write short answers to any NINE questions:

- i- What is feasible region?
- ii- Derive equation of circle in standard form.
- iii- Write an equation of circle with centre $(-3, 5)$ and radius 7.
- iv- Check the position of point $(5, 6)$ with respect to circle: $2x^2 + 2y^2 + 12x - 8y + 1 = 0$
- v- Find equation of hyperbola with foci $(0, \pm 9)$, directrices $y = \pm 4$.
- vi- Find the focus and directrix of the parabola if $x^2 = 5y$.
- vii- Find an equation of ellipse with foci $(\pm 3, 0)$ and minor axis length 10.
- viii- Indicate the solution set of system of linear inequality by shading $4x - 3y \leq 12$; $x \geq -\frac{3}{2}$
- ix- Define equal vector, give an example.
- x- Find the magnitude and direction cosines of $\underline{v} = 4\hat{i} - 5\hat{j}$
- xi- Find scalar " α " so that the vectors $2\hat{i} + \alpha\hat{j} + 5\hat{k}$ and $3\hat{i} + \hat{j} + \alpha\hat{k}$ are perpendicular.
- xii- Which vectors, if any, are parallel or perpendicular
 $\underline{u} = \hat{i} + 2\hat{j} - \hat{k}$, $\underline{v} = -\hat{i} + \hat{j} + \hat{k}$, $\underline{w} = \frac{-\pi}{2}\hat{i} - \pi\hat{j} + \frac{\pi}{2}\hat{k}$
- xiii- 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.

SECTION II

- 5- (a) Evaluate $\lim_{\theta \rightarrow 0} \frac{\tan \theta - \sin \theta}{\sin^3 \theta}$ 5
- (b) If $\tan y(1 + \tan x) = 1 - \tan x$, show that $\frac{dy}{dx} = -1$ 5
- 6- (a) If $x = \sin \theta$, $y = \sin m\theta$, show that $(1 - x^2)y_2 - xy_1 + m^2y = 0$ 5
- (b) Evaluate $\int \frac{\sqrt{2}}{\sin x + \cos x} dx$ 5
- 7- (a) Evaluate $\int_0^{\frac{\pi}{4}} \frac{1}{1 + \sin x} dx$ 5
- (b) Maximize $f(x, y) = 2x + 5y$, subject to the constraints $2y - x \leq 8$; $x - y \leq 4$; $x \geq 0$; $y \geq 0$. 5
- 8- (a) Find the length of the chord cut off from the line $2x + 3y = 13$ by the circle $x^2 + y^2 = 26$. 5
- (b) Prove that in any $\triangle ABC$, $b^2 = c^2 + a^2 - 2ca \cos B$ 5
- 9- (a) Find the interior angles of a triangle with vertices $A(-2, 11)$, $B(-6, -3)$ and $C(4, -9)$ 5
- (b) Find the centre, foci, eccentricity, vertices and directrices of the Ellipse $x^2 + 4y^2 = 16$ 5

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