

OBJECTIVE

Q. 7: Some possible answers to each statement are given below. Tick (P) mark the correct answer.

i) if 'P' is the parameter of a square and 'A' is its area, then $P = :$

- a) \sqrt{A}
- b) $2\sqrt{A}$
- c) $3\sqrt{A}$
- d) $4\sqrt{A}$

ii) $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x = :$

- a) 0
- b) 1
- c) 2
- d) e

iii) $\frac{d}{dx}(x^n)$

- a) nx^{n+1}
- b) nx^{n-1}
- c) $(n-1)x^{n-1}$
- d) $(n-1)x$

iv) Let $\frac{d}{dx}(\ln x) = :$

- a) 0
- b) $\frac{1}{x}$
- c) 1
- d) e^x

v) if $y = e^{2x}$, then $y_4 =$

- a) $16e^{2x}$
- b) $8e^{2x}$
- c) $4e^{2x}$
- d) $2e^{2x}$

vi) $\int x^n dx = :$

- a) $\frac{x^{n+1}}{n+1} + c$
- b) $\frac{x^{n-1}}{n-1} + c$
- c) $x^n + c$
- d) $x^{n-1} + c$

vii) $\int \sec x \cdot dx =$

- a) $\ln(\sec x + \tan x) + c$
- b) $\ln(\cos ec x - \cot x) + c$
- c) $\ln(\sec x - \tan x) + c$
- d) $\ln(\tan x - \sec x) + c$

viii) $\int \ln x dx = :$

- a) $x \ln x - x + c$
- b) $x \ln x + x + c$
- c) $x^2 \ln x + c$
- d) $x \ln x - \frac{x^2}{2} + c$

ix) $\int_0^{\frac{\pi}{6}} \sin x dx = :$

- a) $1 + \frac{\sqrt{3}}{2}$
- b) $1 - \frac{\sqrt{3}}{2}$
- c) $\frac{1}{2}$
- d) -2

x) The solution of differential equation $\frac{dy}{dx} = \cos x$ is :

- a) $y = \cos x + c$
- b) $y = \tan x + c$
- c) $y = \sin x + c$
- d) $y = \cot x + c$

xi) The mid point of the line joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$

- | | |
|------------------------------------------------------------|------------------------------------------------------------|
| a) $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ | b) $\left(\frac{x_1 + y_1}{2}, \frac{x_2 + y_2}{2}\right)$ |
| c) $\left(\frac{x_1 - x_2}{2}, \frac{y_1 - y_2}{2}\right)$ | d) $\left(\frac{x_2 - x_1}{2}, \frac{y_2 - y_1}{2}\right)$ |

xii) The perpendicular distance of a line $12x + 5y = 7$ is :

- a) $\frac{1}{13}$ b) $\frac{13}{7}$ c) $\frac{7}{13}$ d) 13

xiii) $2x + 3y < 0$ is :

- a) An equation b) Inequality
c) Identity d) Not identity

xiv) Equation of a circle with centre at (0, 0) and radius $= \sqrt{5}$:

- a) $x^2 + y^2 = 5$ b) $x^2 + y^2 = 25$
c) $-x^2 + y^2 = 25$ d) $x^2 - y^2 = 25$

xv) Slope of the tangent to parabola $y^2 = 4ax$ at (a, 2a) is :

- a) -1 b) 1 c) 2 d) 3

xvi) The length of the Latus Rectum of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is :

- a) $\frac{2b^2}{a}$ b) $\frac{b^2}{2a}$ c) $\frac{2a^2}{b}$ d) $\frac{a^2}{2b}$

xvii) Transverse axis of hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is :

- a) $x = \frac{a}{e}$ b) $y = \frac{a}{e}$ c) $x = 0$ d) $y = 0$

xviii) Equation of the normal to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at (x₁, y₁) is :

- a) $\frac{xx_1}{a^2} + \frac{yy_1}{b^2} = 1$ b) $\frac{xx_1}{a^2} - \frac{yy_1}{b^2} = 1$
c) $\frac{a^2x}{x_1} - \frac{b^2y}{y_1} = a^2 - b^2$ d) $xx_1 + yy_1 = a^2b^2$

xix) if $P = (2, 3)$, $Q = (6, -2)$, then \vec{PQ} is :

- a) $4\hat{i} + 5\hat{j}$ b) $-4\hat{i} + 5\hat{j}$
c) $4\hat{i} - 5\hat{j}$ d) $5\hat{i} - 4\hat{j}$

xx) If \vec{A} , \vec{B} are parallel, then $\vec{A} \times \vec{B}$ is :

- a) 0 b) 1 c) -1 d) 2

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Section – I

Note: All questions are to be attempted on answer book.

Q #2: Write any TWENTY-FIVE short answers of the following questions: 50

- (i) Find the domain of $g(x) = \sqrt{x^2 - 4}$
- (ii) Evaluate $\lim_{x \rightarrow 0} \frac{x}{\tan x}$
- (iii) Define continuous function.
- (iv) Differentiate $\frac{a+x}{a-x}$ w. r. to x .
- (v) Differentiate $\cos \sqrt{x} + \sin \sqrt{x}$ w. r. to x .
- (vi) Find $\frac{dy}{dx}$ if $y = \sinh^{-1}(x^3)$
- (vii) If $y = x^2 \cdot e^{-x}$, find y_2 .
- (viii) Determine the interval for which $f(x) = 4 - x^2$; $x \in (-2, 2)$
- (ix) Use differential to find the value of $\frac{dy}{dx}$ if $x^2 + 2y^2 = 16$
- (x) Evaluate $\int \sqrt{1 - \cos(2x)} \cdot dx$
- (xi) Evaluate $\int a^{x^2} \cdot x \cdot dx$
- (xii) Evaluate $\int x \cdot \ln x \cdot dx$
- (xiii) Evaluate $\int \frac{2a}{x^2 - a^2} \cdot dx$; $x > a$
- (xiv) Define definite integral.
- (xv) Find the area between x-axis and the curve $y = x^2 + 1$ from $x = 1$ to $x = 2$
- (xvi) Solve the differential equation $\frac{dy}{dx} = \frac{1-x}{y}$
- (xvii) Find the coordinates of a point that divides the join of $A(-6, 2)$ and $B(5, -2)$ in the ratio $2 : 3$
- (xviii) Define the inclination of a line.
- (xix) Check whether the point $(-2, 4)$ lies above or below the line $4x + 5y - 3 = 0$
- (xx) Check whether the three points $A(1, 4)$, $B(2, -3)$, $C(3, -10)$ are collinear or not
- (xxi) Find the angle from the line with slope $-\frac{7}{3}$ to the line with slope $\frac{5}{2}$
- (xxii) Find the measure of the angle between the lines represented by $x^2 - xy - 6y^2 = 0$.
- (xxiii) What is linear inequality?
- (xxiv) What is feasible solution set?
- (xxv) Define Objective function.
- (xxvi) Find the centre and radius of circle $4x^2 + 4y^2 - 8x + 12y - 25 = 0$
- (xxvii) Find the vertex and focus of parabola $x^2 - 4x - 8y + 4 = 0$
- (xxviii) find the foci and eccentricity for ellipse $25x^2 + 9y^2 = 225$
- (xxix) Find equation of hyperbola with foci (0 ± 6) , $e = 2$
- (xxx) Find the equation of tangent to $3x^2 - 7y^2 + 2x - y - 48 = 0$
- (xxxi) Find the equation of $9x^2 - 4y^2 + 36x + 8y - 4 = 0$ with respect to the origin $(-2, 1)$
- (xxxii) Write the condition that $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ may be a parabola
- (xxxiii) If α, β, γ , are the direction angles of a vector then prove that

$$\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = 1$$
- (xxxiv) Find projection of $\bar{u} = 3\bar{i} + \bar{j} - \bar{k}$ on $\bar{v} = -2\bar{i} - \bar{j} + \bar{k}$

- (xxxv) Find a vector perpendicular to $\underline{a} = \hat{i} + \hat{j}$, $\underline{b} = \hat{i} - \hat{j}$.
- (xxxvi) Find α so that $a\hat{i} + \hat{j}$, $\hat{i} + \hat{j} + 3\hat{k}$ and $2\hat{i} + \hat{j} - 2\hat{k}$.
- (xxxvii) Find the volume of parallelepiped with edges $\underline{u} = 3\hat{i} + 2\hat{k}$, $\underline{v} = \hat{i} + 2\hat{j} + \hat{k}$, $\underline{w} = -\hat{j} + 4\hat{k}$

Section - II

Note: Attempt any THREE questions. (5+5 marks each question)

Q # 3 (a) If $f(x) = \begin{cases} \frac{\sqrt{2x+5} - \sqrt{x+7}}{x-2}, & x \neq 2; \\ k, & x = 2. \end{cases}$

Find the value of k so that f is continuous at $x = 2$.

(b) Find y_4 if $y = \cos^3 x$.

Q # 4 (a) Evaluate $\int \sqrt{a^2 + x^2} dx$ **(b)** Evaluate $\int_0^1 \frac{3x}{\sqrt{4-3x}} dx$

Q # 5 (a) Find the distance of the point (x_1, y_1) from the line $ax + by + c = 0$

(b) Graph the feasible region of the following system of linear inequalities and find the corner points

$$\begin{aligned} 2x + 3y &\leq 18, \\ x + 4y &\leq 12, \\ 3x + y &\leq 12, \\ x &\geq 0, \quad y \geq 0. \end{aligned}$$

Q # 6 (a) Write equation of circle passing through the given points

$$A(4, 5), B(-4, -3), C(8, -3)$$

(b) Find centre, foci, eccentricity, vertices and directrices of the ellipse

$$x^2 + 16y^2 - 16y + 76 = 0.$$

Q # 7 (a) Find the projection of \underline{a} along \underline{b} when $\underline{a} = [3, 1, -1]$ and $\underline{b} = [-2, -1, 1]$.

(b) Find the area of the triangle using vector method having vertices

$$(1, -1, 1), (2, 1, -1), (-1, 1, 2)$$

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