SOLUTIONS
IIT JEE-2009 PAPER-1
SECTION -I
Single Correct Choice Type

This section contains 8 multiple choice questions. Each question has 4 choices. (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

Q.21 Let $z = \cos\theta + i\sin\theta$. Then the value of

$$\sum_{m=1}^{15} \text{Im}(z^{2m-1})$$

at $\theta = 2°$ is

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

[Sol. **[D]**

$z = \cos\theta + i\sin\theta = e^{i\theta}$; $\theta = 2°$

$z^{2m-1} = e^{i(2m-1)\theta} = \cos(2m-1)\theta + i\sin(2m-1)\theta$

$$S = \sum_{m=1}^{15} \text{Im}(z^{2m-1}) = \sum_{m=1}^{15} \sin(2m-1)\theta$$

$\therefore$ $S = \sin\theta + \sin 3\theta + \sin 5\theta + \ldots.. + \sin 29\theta$

$$= \frac{\sin(15\theta)}{\sin\theta}\cdot\sin(15\theta) \qquad (\text{given } \theta = 2°)$$

$$= \frac{\sin^2 30°}{\sin 2°} = \frac{1}{4\sin 2°} \quad \Rightarrow \quad \textbf{(D)}\ ]$$

Q.22 The number of seven digit integers, with sum of the digits equal to 10 and formed by using the digits 1, 2 and 3 only, is

(A) 55 (B) 66 (C) 77 (D) 88

Sol. **[C]**

Possible cases are

$$3\ 2\ 1\ 1\ 1\ 1\ 1 \rightarrow \frac{7!}{5!} = 42$$

or $$2\ 2\ 2\ 1\ 1\ 1\ 1 \rightarrow \frac{7!}{4!\cdot 3!} = 35$$

$\therefore$ number of 7 digits number is $42 + 35 = 77$ **Ans.** $\Rightarrow$ **(C)**

<u>Alternatively</u>: coefficient of x^{10} in $(x + x^2 + x^3)^7$

or coefficient of x^3 in $(1 + x + x^2)^7$]

Q.23 Let P(3, 2, 6) be a point in space and Q be a point on the line

$$\vec{r} = (\hat{i} - \hat{j} + 2\hat{k}) + \mu(-3\hat{i} + \hat{j} + 5\hat{k})$$

Then the value of μ for which the vector $\overrightarrow{PQ}$ is parallel to the plane $x - 4y + 3z = 1$ is

(A) $\frac{1}{4}$ (B) $-\frac{1}{4}$ (C) $\frac{1}{8}$ (D) $-\frac{1}{8}$

Sol. **[A]**

$\vec{r} = (\hat{i} - \hat{j} + 2\hat{k}) + \mu(-3\hat{i} + \hat{j} + 5\hat{k})$

position vector of Q is $(1-3\mu)\hat{i} + (\mu-1)\hat{j} + (5\mu+2)\hat{k}$

position vector of P is $3\hat{i} + 2\hat{j} + 6\hat{k}$

$\Rightarrow \quad \overrightarrow{PQ} = (2+3\mu)\hat{i} + (3-\mu)\hat{j} + (4-5\mu)\hat{k}$

given **PQ** is parallel to the plane $x - 4y + 3z = 1$

vector normal to plane is $\vec{n} = \hat{i} - 4\hat{j} + 3\hat{k}$

hence $\overrightarrow{PQ} \cdot \vec{n} = 0$

$(2 + 3\mu) - 4(3 - \mu) + 3(4 - 5\mu) = 0$

$2 - 8\mu = 0 \quad \Rightarrow \quad \mu = 1/4$ **Ans.** $\Rightarrow$ **(A)**]

Q.24 Let f be a non–negative function defined on the interval [0,1]. If

$$\int_0^x \sqrt{1-(f'(t))^2}\,dt = \int_0^x f(t)\,dt, \quad 0 \le x \le 1,$$

and f(0) = 0, then

(A) $f\left(\frac{1}{2}\right) < \frac{1}{2}$ and $f\left(\frac{1}{3}\right) > \frac{1}{3}$ (B) $f\left(\frac{1}{2}\right) > \frac{1}{2}$ and $f\left(\frac{1}{3}\right) > \frac{1}{3}$

(C) $f\left(\frac{1}{2}\right) < \frac{1}{2}$ and $f\left(\frac{1}{3}\right) < \frac{1}{3}$ (D) $f\left(\frac{1}{2}\right) > \frac{1}{2}$ and $f\left(\frac{1}{3}\right) < \frac{1}{3}$

[Sol. **[C]**

$f(x) \ge 0 \qquad \forall\ x \in [0, 1]$

$$\int_0^x \sqrt{1-(f'(t))^2}\,dt = \int_0^x f(t)\,dt$$

differentiate both the sides let $y = f(x)$; $f'(x) = \frac{dy}{dx}$

$$\sqrt{1-(f'(x))^2} = f(x)$$

$$1-(f'(x))^2 = (f(x))^2$$

$$1-\left(\frac{dy}{dx}\right)^2 = y^2 \quad \Rightarrow \quad \left(\frac{dy}{dx}\right)^2 = 1-y^2 \quad \Rightarrow \quad \frac{dy}{dx} = \pm\sqrt{1-y^2}$$

$$\int \frac{dy}{\sqrt{1-y^2}} = \pm\int dx$$

$\sin^{-1}y = \pm (x + C)$

$y = \pm \sin (x + C)$

$y|_{x=0} = 0 \quad \Rightarrow \quad C = 0$

$y = \pm \sin x$ (–ve sign reject $\because$ $f(x) \ge 0$)

$y = \sin x$

now $\dfrac{\sin x}{x} < 1 \quad \forall\ x \in (0, 1]$

$\sin\left(\dfrac{1}{2}\right) < \dfrac{1}{2}$ and $\sin\left(\dfrac{1}{3}\right) < \dfrac{1}{3} \Rightarrow$ **(C)**]

Q.25 Let $z = x + iy$ be a complex number where x and y are integers. Then the area of the rectangle whose vertices are the roots of the equation

$$z\bar{z}^3 + \bar{z}z^3 = 350 \quad \text{is}$$

(A) 48 (B) 32 (C) 40 (D) 80

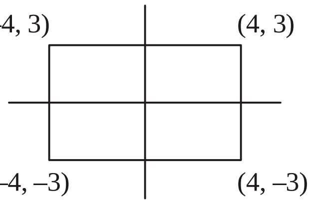
[Sol. **[A]**

$z\bar{z}(\bar{z}^2 + z^2) = 350$

put $z = x + iy$

$(x^2 + y^2)(x^2 - y^2) = 175 = 25 \cdot 7$

$= 35 \cdot 5$



$x^2 + y^2 = 25$ $\quad$ $x^2 + y^2 = 35$

$x^2 - y^2 = 7$ $\quad$ $x^2 - y^2 = 5$

rejected ($\because$ x and y are integer)

$x^2 = 16 \Rightarrow x = \pm 4$

$\therefore$ $x = 4$; $y = 3$

$x = -4$; $y = -3$

$x = 4$; $y = -3$

$x = -4$; $y = 3$

$\therefore$ area of rectamgle $= 6 \times 8 = 48$ **Ans.** $\Rightarrow$ **(A)**]

Q.26 Tangents drawn from the point P(l, 8) to the circle

$$x^2 + y^2 - 6x - 4y - 11 = 0$$

touch the circle at the points A and B. The equation of the circumcircle of the triangle PAB is

(A) $x^2 + y^2 + 4x - 6y + 19 = 0$ (B) $x^2 + y^2 - 4x - 10y + 19 = 0$

(C) $x^2 + y^2 - 2x + 6y - 29 = 0$ (D) $x^2 + y^2 - 6x - 4y + 19 = 0$

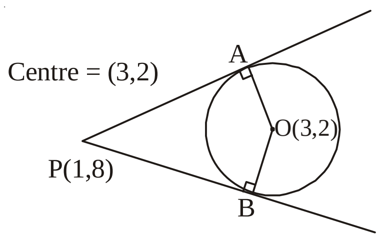
[Sol. **[B]**

Circumcircle of ΔPAB will pass through the centre of circle

i.e. circle of diammetrical form

$(x - 1)(x - 3) + (y - 8)(y - 2) = 0$

$x^2 + y^2 - 4x - 10y + 19 = 0 \quad \Rightarrow$ **(B)**]



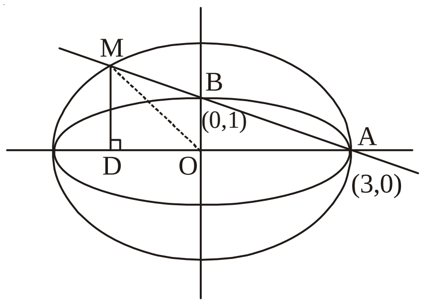
Q.27 The line passing through the extremity A of the major axis and extremity B of the minor axis of the ellipse $x^2 + 9y^2 = 9$ meets its auxiliary circle at the point M. Then the area of the triangle with vertices at A, M and the origin O is

(A) $\frac{31}{10}$ (B) $\frac{29}{10}$ (C) $\frac{21}{10}$ (D) $\frac{27}{10}$

[Sol. **[D]**

Equation of ellipse

$$\frac{x^2}{9} + \frac{y^2}{1} = 1$$



equation of auxillary circle $x^2 + y^2 = 9$

equation of line AB

$$\frac{x}{3} + \frac{y}{1} = 1 \quad \Rightarrow \quad x + 3y = 3$$

point of intersection of line AB and auxillary circle

$(3 - 3y)^2 + y^2 = 9$

$10y^2 = 18y$

$y = 0,\ 9/5$

Area = $\frac{1}{2}(OA)(MD) = \frac{1}{2} \times 3 \times \frac{9}{5} = \frac{27}{10}$ **Ans.** $\Rightarrow$ **(D)**]

Q.28 If $\vec{a}, \vec{b}, \vec{c}$ and $\vec{d}$ are unit vectors such that $(\vec{a} \times \vec{b}) \cdot (\vec{c} \times \vec{d}) = 1$ and $\vec{a} \cdot \vec{c} = \frac{1}{2}$, then

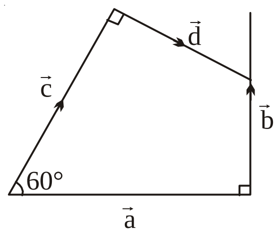
(A) $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar (B) $\vec{b}, \vec{c}, \vec{d}$ are non-coplanar

(C) $\vec{b}, \vec{d}$ are non-parallel (D) $\vec{a}, \vec{d}$ are parallel and $\vec{b}, \vec{c}$ are parallel

[Sol. **[C]**

Given $(\vec{a} \times \vec{b}) \cdot (\vec{c} \times \vec{d}) = 1 \quad \Rightarrow \quad (\sin\theta\, \hat{n}_1)(\sin\phi\, \hat{n}_2) = 1$

$\therefore \quad \sin\theta \sin\phi \cos\beta = 1 \quad ....(1)$



(1) is possible only if $\theta = \phi = \frac{\pi}{2}$ and $\beta = 0$

where $\theta = \vec{a} \wedge \vec{b}$; $\phi = \vec{c} \wedge \vec{d}$; $\beta = (\vec{a} \times \vec{b}) \wedge (\vec{c} \times \vec{d})$

it will satisfy only when $\vec{a}$ is perpendicular to $\vec{b}$, $\vec{c}$ is perpendicular to $\vec{d}$ and $(\vec{a} \times \vec{b}) \| (\vec{c} \times \vec{d})$

simultaneously $\vec{a} \cdot \vec{c} = \frac{1}{2} \quad \Rightarrow \quad \theta = 60°$ (between $\vec{a}$ and $\vec{c}$)

hence $\vec{a}, \vec{b}, \vec{c}$ and $\vec{d}$ will be coplanar and $\vec{b}, \vec{d}$ are non parallel **Ans.** $\Rightarrow$ **(C)**]

SECTION -II
Multiple Correct Choice Type

This section contains 4 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONE OR MORE** is/are correct.

Q.29 Let

$$L = \lim_{x \to 0} \frac{a - \sqrt{a^2 - x^2} - \frac{x^2}{4}}{x^4}, \ a > 0$$

If L is finite, then

(A) $a = 2$ (B) $a = 1$ (C) $L = \frac{1}{64}$ (D) $L = \frac{1}{32}$

[Sol. **[A, C]**

$$L = \lim_{x \to 0} \frac{a - \sqrt{a^2 - x^2} - \frac{x^2}{4}}{x^4} \quad \left(\frac{0}{0}\right), \quad a > 0$$

$$= \lim_{x \to 0} \frac{\frac{1}{2\sqrt{a^2 - x^2}}(2x) - \frac{x}{2}}{4x^3} = \lim_{x \to 0} \frac{\frac{1}{\sqrt{a^2 - x^2}} - \frac{1}{2}}{4x^2}$$

now As $x \to 0$, $D^r \to 0$

$\therefore$ $N^r \to 0$

$$\Rightarrow \quad \frac{1}{\sqrt{a^2}} = \frac{1}{2} \quad \Rightarrow \quad a = 2 \quad \textbf{Ans.} \quad \Rightarrow \quad \textbf{(A)}$$

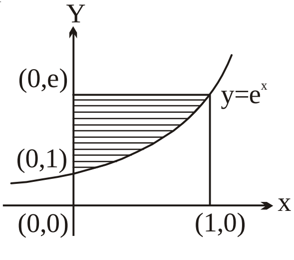
now $$L = \lim_{x \to 0} \frac{\frac{1}{\sqrt{4 - x^2}} - \frac{1}{2}}{4x^2} = \lim_{x \to 0} \frac{\left(2 - \sqrt{4 - x^2}\right) \times \left(2 + \sqrt{4 - x^2}\right)}{8x^2 \left(\sqrt{4 - x^2}\right)\left(2 + \sqrt{4 - x^2}\right)}$$

$$L = \frac{1}{8 \times 2 \times 4} = \frac{1}{64} \quad \textbf{Ans.} \quad \Rightarrow \quad \textbf{(C)}]$$

Q.30 Area of the region bounded by the curve $y = e^x$ and lines $x = 0$ and $y = e$ is

(A) $e - 1$ (B) $\int_1^e \ln(e + 1 - y)dy$ (C) $e - \int_1^e e^x dx$ (D) $\int_1^e \ln y \ dy$

[Sol. **[B, C, D]**



Required area = $\int_0^1 (e - e^x) dx = e - \int_0^1 e^x \, dx$

$\therefore$ option **(C)** is correct

Also required area = $\int_0^e \ln y \, dx$ .....(1) (on integrating along y-axis)

... **(D)** is correct

by king property in (1), we also get

required area = $\int_1^e \ln(1+e-y)\,dy$

$\therefore$ option **(B)** is also correct]

Q.31 If $\dfrac{\sin^4 x}{2} + \dfrac{\cos^4 x}{3} = \dfrac{1}{5}$, then

(A) $\tan^2 x = \dfrac{2}{3}$

(B) $\dfrac{\sin^8 x}{8} + \dfrac{\cos^8 x}{27} = \dfrac{1}{125}$

(C) $\tan^2 x = \dfrac{1}{3}$

(D) $\dfrac{\sin^8 x}{8} + \dfrac{\cos^8 x}{27} = \dfrac{2}{125}$

[Sol. **[A, B]**

$\dfrac{5}{2}\sin^4 x + \dfrac{5}{3}\cos^4 x = 1$

divide by $\cos^4 x$

$\dfrac{5}{2}\tan^4 x + \dfrac{5}{3} = \sec^4 x \Rightarrow \dfrac{5}{2}\tan^4 x + \dfrac{5}{3} = (1+\tan^2 x)^2$

$\Rightarrow 15\tan^4 x + 10 = 6(1 + \tan^4 x + 2\tan^2 x) \Rightarrow 9\tan^4 x - 12\tan^2 x + 4 = 0$

$\Rightarrow (3\tan^2 x - 2)^2 = 0 \Rightarrow \tan^2 x = \dfrac{2}{3}$ **Ans.** $\Rightarrow$ **(A)**

$1 + \tan^2 x = \dfrac{5}{3}$

$\cos^2 x = \dfrac{3}{5}$; $\sin^2 x = \dfrac{2}{5}$

Verify: $\dfrac{\sin 8x}{8} + \dfrac{\cos^8 x}{27} = \dfrac{16}{325\times 8} + \dfrac{81}{27\times 625} = \dfrac{5}{625} = \dfrac{1}{125}$ **Ans.** $\Rightarrow$ **(B)**]

Q.32 In a triangle ABC with fixed base BC, the vertex A moves such that

$$\cos B + \cos C = 4\sin^2\frac{A}{2}.$$

If a, b and c denote the lengths of the sides of the triangle opposite to the angles A, Band C, respectively, then

(A) $b + c = 4a$

(B) $b + c = 2a$

(C) locus of point A is an ellipse

(D) locus of point A is a pair of straight lines

[Sol. **[B, C]**

$\cos B + \cos C = 4\sin^2\dfrac{A}{2}$

$2\cos\dfrac{B+C}{2}\cos\dfrac{B-C}{2} = 4\sin^2\dfrac{A}{2}$

$\Rightarrow \quad \cos\frac{B-C}{2} = 2\sin\frac{A}{2}$

multiply $\cos\frac{A}{2}$

$\Rightarrow \quad 2\cdot\sin\frac{B+C}{2}\cos\frac{B-C}{2} = 2\cdot 2\sin\frac{A}{2}\cos\frac{A}{2}$

$\Rightarrow \quad \sin B + \sin C = 2\sin A$

$b + c = 2a$ (Sine law) **Ans.** $\Rightarrow$ **(B)**

given base is fixed so a = constnat

$b + c$ = constant

locus of point A is ellipse **Ans.** $\Rightarrow$ **(C)**]

SECTION - III
Comprehension Type

This section contains 2 groups of questions. Each group has 3 multiple choice questions .based on a paragraph. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

Paragraph for Question Nos. 33 to 35

Let A be the set of all 3×3 symmetric matrices all of whose entries are either 0 or 1. Five of these entries are 1 and four of them are 0.

Q.33 The number of matrices in A is

(A) 12 (B) 6 (C) 9 (D) 3

[Sol. **[A]**

Diagonal (1, 1, 1) non diagonal (1, 1) (0, 0) (0, 0) = $\frac{3!}{2!} \times 1 = 3$

Diagonal (1, 0, 0) (1, 1) (1, 1) (0, 0) = $\frac{3!}{2!} \times 3 = 9$

diagonal elements permute 12]

Q.34 The number of matrices A in A for which the system of linear equations

$$A\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

has a unique solution, is

(A) less than 4 (B) at least 4 but less than 7

(C) at least 7 but less than 10 (D) at least 10

[Sol. **[B]**

$A_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \end{pmatrix}$; $A_2 = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 0 & 0 \\ 1 & 0 & 0 \end{pmatrix}$; $A_3 = \begin{pmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$; $A_4 = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 1 \end{pmatrix}$; $A_5 = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{pmatrix}$

$|A_i| = 0$]

Q.35 The number of matrices A in A for which the system of linear equations

$$A\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

is inconsistent, is

(A) 0 (B) more than 2 (C) 2 (D) 1

[Sol. **[B]**

$$A_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix} ; A_2 = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 0 & 0 \\ 1 & 0 & 0 \end{pmatrix} ; A_3 = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{pmatrix} ; A_4 = \begin{pmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} ; A_5 = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 1 \end{pmatrix}$$

$$\text{Adj } A_i \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \neq 0. \text{ Then inconsistent}$$

Now

$$\text{Adj. } A_i = \begin{pmatrix} - & - & - \\ - & - & - \\ - & - & - \end{pmatrix} \times \underbrace{\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}}_{B}$$

If any non zero then Adj $(A_i) \cdot B \neq 0$

$$\Rightarrow \text{ Adj } A_4 = \begin{pmatrix} - & - & - \\ - & - & - \\ - & - & - \end{pmatrix}$$

non zero

$$\text{Adj } A_5 = \begin{pmatrix} - & - & - \\ - & - & - \\ - & - & - \end{pmatrix}$$

non zero

$$\text{Adj } (A_3) = \begin{pmatrix} - & - & - \\ - & - & - \\ - & - & - \end{pmatrix}$$]

non zero

Paragraph for Question Nos. 36 to 38

A fair die is tossed repeatedly until a six is obtained. Let X denote the number of tosses required.

Q.36 The probability that X = 3 equals

(A) $\frac{25}{216}$ (B) $\frac{25}{36}$ (C) $\frac{5}{36}$ (D) $\frac{125}{216}$

[Sol. **[A]**

Probability six in third attempt = $\frac{5}{6} \times \frac{5}{6} \times \frac{1}{6} = \frac{25}{216}$ **Ans.** $\Rightarrow$ **(A)**]

Q.37 The probability that $X \geq 3$ equals

(A) $\frac{125}{216}$ (B) $\frac{25}{36}$ (C) $\frac{5}{36}$ (D) $\frac{25}{216}$

[Sol. **[B]**

$x \geq 3$

$$= \left(\frac{5}{6}\right)^2 \frac{1}{6} + \left(\frac{5}{6}\right)^3 \frac{1}{6} \ .... \ \infty$$

$$= \frac{\left(\frac{5}{6}\right)^2 \frac{1}{6}}{1 - \frac{5}{6}} = \frac{25}{36}$$ **Ans.** $\Rightarrow$ **(B)**]

Q.38 The conditional probability that $X \geq 6$ given $X > 3$ equals

(A) $\frac{125}{216}$ (B) $\frac{25}{216}$ (C) $\frac{5}{36}$ (D) $\frac{25}{36}$

[Sol. **[D]**

Probability $= \frac{x \geq 6}{x > 3}$

$$= \frac{\left(\frac{5}{6}\right)^5 \frac{1}{6} + \left(\frac{5}{6}\right)^6 \frac{1}{6} .... \infty}{\left(\frac{5}{6}\right)^3 \frac{1}{6} + \left(\frac{5}{6}\right)^4 \frac{1}{6} .... \infty}$$

$= \frac{25}{36}$ **Ans.** $\Rightarrow$ **(D)**]

Q.39 Match the statements/expressions In **Column I** with the open intervals In **Column II.**

	Column I		Column II
(A)	Interval contained in the domain of definition of non-zero solutions of the differential equation $(x-3)^2 y' + y = 0$	(p)	$\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$
(B)	Interval containing the value of the integral $\int_1^5 (x-1)(x-2)(x-3)(x-4)(x-5)dx$	(q)	$\left(0, \frac{\pi}{2}\right)$
(C)	Interval in which at least one of the points of local maximum of $\cos^2 x + \sin x$ lies	(r)	$\left(\frac{\pi}{8}, \frac{5\pi}{4}\right)$
(D)	Interval in which $\tan^{-1}(\sin x + \cos x)$ is increasing	(s)	$\left(0, \frac{\pi}{8}\right)$
		(t)	$(-\pi, \pi)$

[Ans (A) p, q, s (B) p, t (C) p, q, r, t (D) s]

[Sol. (A) On solving the differential equation

$$-\int \frac{dy}{y} = \int \frac{dx}{(x-3)^2} \quad \Rightarrow \quad \text{you can check very easily } x \neq 3.$$

(B) Let $x - 3 = t \quad \Rightarrow \quad t = -2$ as $x \to 1$

$t = 2$ as $x \to 5$

$$\int_{-2}^{2} (t+2)(t-1)\ t\ (t+1)\ (t+2)dt$$

on solving this will be completly odd hence equals to 0.

(C) $f'(x) = 2\cos x(-\sin x) + \cos x = 0$

$y = f(x)$ will take maximum at $x = \frac{\pi}{6}$

(D) $y = \tan^{-1}(\sin x + \cos x)$ will be $(\uparrow)$ increasing when $\sin x + \cos x$ is $\uparrow$]

Q.40 Match the conics in **Column I** with the statements/expressions in **Column II.**

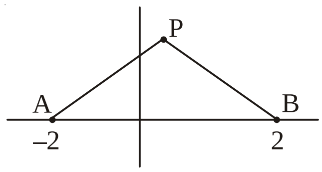
	Column I		**Column II**
(A)	Circle	(p)	The locus of the point (h, k) for which the line hx + ky = 1 touches the circle $x^2 + y^2 = 4$
(B)	Parabola	(q)	Points z in the complex plane satisfying $\lvert z + 2\rvert - \lvert z - 2\rvert = \pm 3$
(C)	Ellipse	(r)	Points of the conic have parametric representation $x = \sqrt{3}\left(\frac{1-t^2}{1+t^2}\right),\ y = \frac{2t}{1+t^2}$
(D)	Hyperbola		
		(s)	The eccentricity of the conic lies in the interval $1 \le x < \infty$
		(t)	Points z in the complex plane satisfying $\text{Re}(z + 1)^2 = \lvert z\rvert^2 + 1$

[Ans. (A) p, (B) s, t; (C) r ; (D) q, s]

[Sol.

(p) $\frac{1}{\sqrt{h^2+k^2}} = 2 \Rightarrow h^2 + k^2 = \frac{1}{4} \Rightarrow x^2 + y^2 = \frac{1}{4} \Rightarrow$ **(A)**

(q) difference of distances from points = constant $\Rightarrow$ **(D)**



(r) $x = \sqrt{3}\cos 2\theta\ ;\ y = \tan 2\theta$

$\frac{x^2}{3} + \frac{y^2}{1} = 1 \Rightarrow$ ellipse $\Rightarrow$ **(C)**

(s) hyperbola (e > 1) and parabola (e = 1) $\Rightarrow$ **(B)** and **(D)**

(t) $\text{Re}((x+iy)+1)^2 = \lvert z\rvert^2 + 1$

$(1 + x)^2 - y^2 = x^2 + y^2 + 1$

$x^2 + 1 + 2x - y^2 = x^2 + y^2 + 1$

$2y^2 = 2x - 1$ (parabola) $\Rightarrow$ **(B)**]