Set. G **Index** Maths Solution

SET (G)

**Q.1** A value of $\theta$ ------ is,

Sol$^n$: for z to be purely imaginary

Ans. (1)

$$z = -\bar{z}$$

$$\frac{2+3i\sin\theta}{1-2i\sin\theta} = -\overline{\left(\frac{2+3i\sin\theta}{1-2i\sin\theta}\right)}$$

$$\frac{2+3i\sin\theta}{1-2i\sin\theta} = -\left[\frac{2-3i\sin\theta}{1+2i\sin\theta}\right].$$

on solving

$$12\sin^2\theta - 4 = 0$$

$$\sin^2\theta = \frac{1}{3}$$

$$\sin\theta = \pm\frac{1}{\sqrt{3}}$$

So option (1) is correct.

**Q.2** The system of ------ for:

Ans. (1)

$$D = \begin{vmatrix} 1 & \lambda & -1 \\ \lambda & -1 & -1 \\ 1 & 1 & -\lambda \end{vmatrix} = 0.$$

on solving.

$$\lambda^3 - \lambda = 0$$

$$\lambda(\lambda^2-1) = 0$$

$\lambda = 0, 1, -1$ so option (1)

PTO

SET(G1)

**Q-3** A wire of length ----- then:

**Sol^n:** Let $\lambda$ part goes to square then $\to (2-\lambda)$ goes to circle.

So $4x = \lambda$ & $2\pi r = 2-\lambda$

$x = \lambda/4$  $r = \left(\frac{2-\lambda}{2\pi}\right)$

Ans. (4)

$A = A_1 + A_2$

$= \frac{\lambda^2}{16} + \pi\left(\frac{2-\lambda}{2\pi}\right)^2$

$A = \frac{\lambda^2}{16} + \frac{\pi(2-\lambda)^2}{4\pi^2}$

So Minimum

$\frac{dA}{d\lambda} = 0$

$\frac{dA}{d\lambda} = \frac{\lambda}{8} + \frac{2(2-\lambda)}{4\pi}(-1) = 0.$

$\hookrightarrow \frac{\lambda}{2} = 2\left(\frac{2-\lambda}{2\pi}\right) \times \frac{2}{2}$

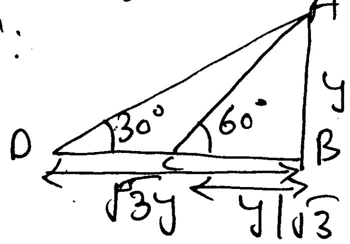
$2x = 4r$

$x = 2r$ so option (4)

**Q-4** A Man is walking - - - - is :?

Sol^n:

Ans. (4)




(केक सुधारी CONCEPT)

$DC = \sqrt{3}y - y/\sqrt{3} = \frac{2y}{\sqrt{3}}$

for $DC \to \frac{2y}{\sqrt{3}} \to 10$ min

for $BC \to \frac{y}{\sqrt{3}} \to 5$ min

So option (4)

PTO.

Q-5 Set (G)

Let two fair --- Not true?

Ans. (1)

$P(E_1) = \frac{1}{6}$ $P(E_2) = \frac{1}{6}$ $P(E_3) = \frac{1}{2}$

$P(E_1 \cap E_2) = \frac{1}{36} = P(E_1) \cdot P(E_2)$

$P(E_2 \cap E_3) = \frac{1}{12} = P(E_2) \cdot P(E_3)$

$P(E_1 \cap E_3) = \frac{1}{12} = P(E_1) \cdot P(E_3)$

So (1) is correct.

Q-6 If the standard ------

Ans. (3)

soln: $\sigma = 3.5 = \frac{35}{10} = \frac{7}{2}$

so $var(x) = \sigma^2 = \frac{49}{4}$

$var(x) = \frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2 = \frac{49}{4}$

$= \frac{134 + a^2}{4} - \left(\frac{6 + a}{4}\right)^2 = \frac{49}{4}$

which gives

$3a^2 - 32a + 84 = 0$

PTO

Set G



**Q.7.**
**Ans: (3)**

For $x \in R$ $f(x) = |\log 2 - \sin x|$

$f(x) = \log 2 - \sin x$ for, $x \in 0^+$ or $0^-$

$g(x) = f(\log 2 - \sin x)$

$g(x) = \log 2 - \sin(\log 2 - \sin x)$

$g'(x) = + \cos(\log(2) - \sin x) \cdot + \cos x$

$g'(0) = \cos \log 2$

Hence, option '3' is correct

**Q-11**
**Ans (3)**

$A = \begin{bmatrix} 5a & -b \\ 3 & 2 \end{bmatrix}$ $A \, AdjA = A \cdot A^T$

$A \, AdjA = |A| I_n$

$(10a + 3b) \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 5a & -b \\ 3 & 2 \end{bmatrix} \begin{bmatrix} 5a & 3 \\ -b & 2 \end{bmatrix}$

$\boxed{a = \frac{2}{5}}$ Put in ①

$\boxed{b = 3}$

$15a - 2b = 0$ ①

$25a^2 + b^2 = 10a + 3b$ ②

$\rightarrow 25a^2 + \frac{225}{4}a^2 = 10a + \frac{45}{2}a$

$\frac{325a^2}{4} = \frac{65a}{2}$

Ans

$\boxed{5 \times \frac{2}{5} + 3 = \boxed{5}}$

SET(G)

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Q29 The area (in sq.) .... is:-

Ans(3)

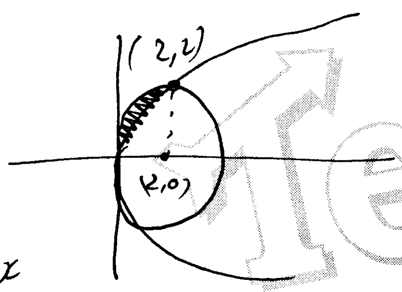
$y^2 \geq 2x$

$x \geq 0$

$y \geq 0$

$x^2 + y^2 \leq 4x$

$(x-2)^2 + y^2 \leq 2^2$




Req. Area $= \frac{1}{4}\pi R^2 - \int_0^2 \sqrt{2x}$

$= \frac{\pi(4)}{4} - \left[\sqrt{2}\,\frac{2x^{3/2}}{3}\right]_0^2$

$= \pi - \left[\frac{2\sqrt{2}\,2\sqrt{2}}{3}\right]$

$= \pi - \frac{8}{3}$

∴ Ans option (3)

SET(G)

Q30 If f(x) ..... then S:

Ans(3)

$f(x) + 2f\left(\frac{1}{x}\right) = 3x$ —(1)

$x \rightarrow \frac{1}{x}$

$f\left(\frac{1}{x}\right) + 2f(x) = \frac{3}{x}$ —(2)

2×(2) − (1)

$3f(x) = \frac{6}{x} - 3x$

$f(x) = \frac{2}{x} - x = \frac{2-x^2}{x}$

$S \Rightarrow f(x) = f(-x)$

$\frac{2-x^2}{x} = \frac{2-x^2}{-x}$

$x \neq 0$ $x = \pm\sqrt{2}$

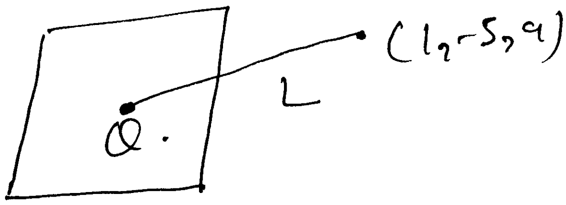
∴ ans option (4)

**Q.8** $P(1,-5,9)$

$L \rightarrow \frac{x}{1} = \frac{y}{1} = \frac{z}{1}$

Ans. (3)

Plane: $x - y + z = 5$.




equation of Line which passes through $(1,-5,9)$ & $\|^{l}$ to L.

$\frac{x-1}{1} = \frac{y+5}{1} = \frac{z-9}{1} = \lambda$

so $x = \lambda+1$
$y = \lambda - 5$
$z = \lambda + 9$

intersection with plane gives

$\lambda + 1 - (\lambda - 5) + \lambda + 9 = 5$

so $Q \rightarrow (-9,-15,-1)$ $\quad \lambda = -10$

$PQ = \sqrt{(1+9)^2 + (-15+5)^2 + (1-9)^2}$

$= 10\sqrt{3}$ so option (3)

**Q.21.**

$I = \int \frac{2x^{12}+5x^9}{(x^5+x^3+1)^3}\,dx$ Apply Kuturputur (Manipulation)

$I = \int \frac{2x^{12}+5x^9}{(x^5)^3(1+x^{-2}+x^{-5})^3} = \int \frac{(2x^{-3}+5x^{-6})\,dx}{(1+x^{-2}+x^{-5})^3}$ ($-dt$, $t$)

$I = -\int \frac{dt}{t^3} = -\left(-\frac{1}{2t^2}\right) = \frac{1}{2(1+x^{-2}+x^{-5})^2} = \frac{x^{10}}{2(x^5+x^3+1)^2} + C$

Ans (3)

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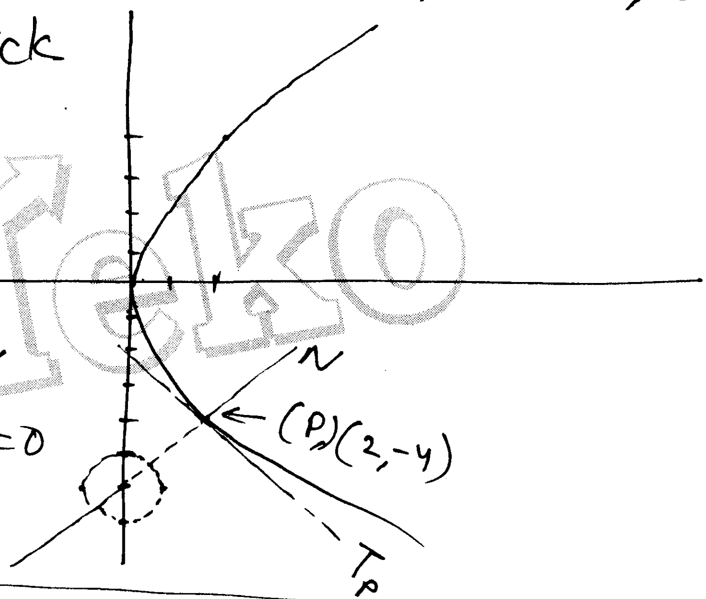
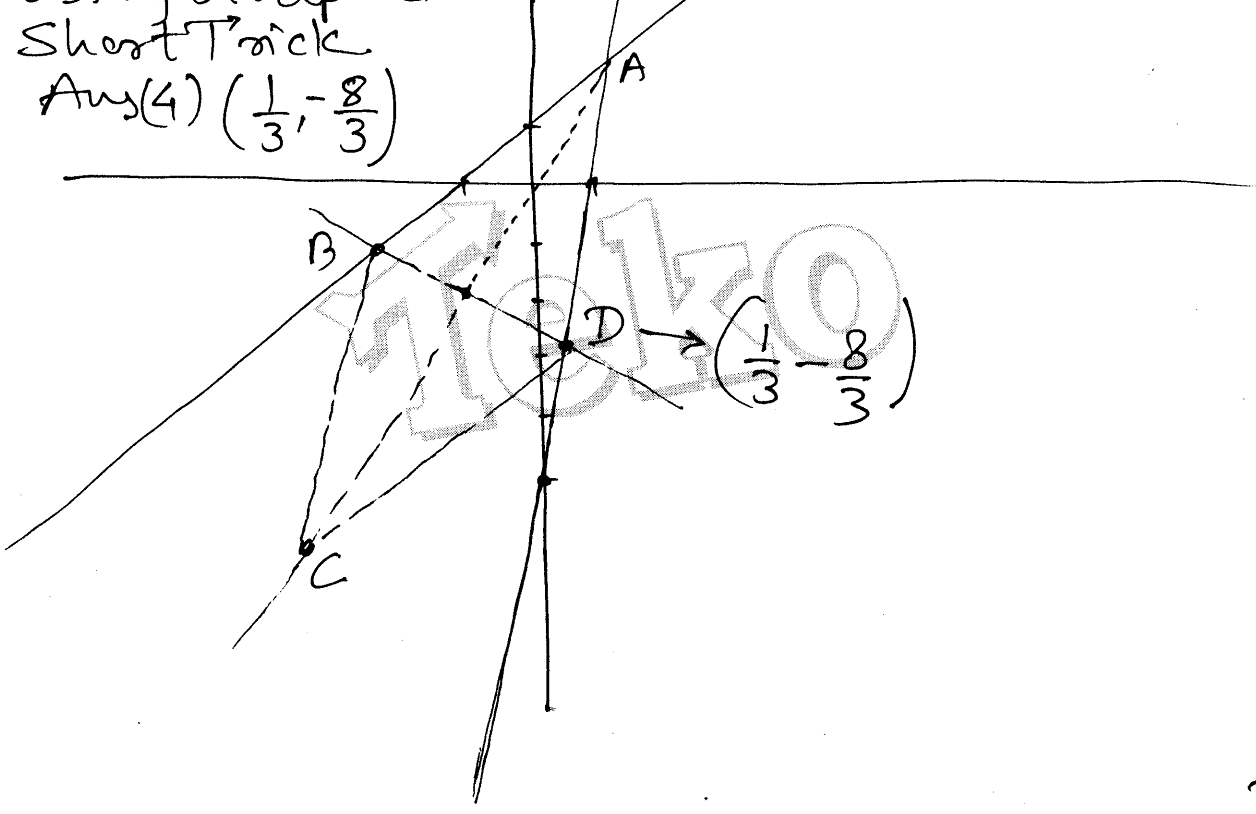
Set G

Q.10. Let P be the point on the parabola, $y^2=8x$.

Suhag Short Trick
$P \to (2,-4)$
in options only
(2) is with
Centre $(2,-4)$
will be answer
$x^2+y^2-4x+8y+12=0$




Q.13. Two sides of rhombus are along the lines,
Using Graph
Short Trick
Ans(4) $\left(\frac{1}{3},-\frac{8}{3}\right)$




PTO

Set G

**Q.17.** If the number of terms in exp. of $\left(1-\frac{2}{x}+\frac{4}{x^2}\right)^n$

**Sol.** Class room que. num. of terms (3)

${}^{n+3-1}C_{3-1} = 28$ given

${}^{n+2}C_2 = 28$

$\frac{(n+2)(n+1)}{\lfloor 2} = 28$

$(n+2)(n+1) = 56 = 8 \times 7$

$n+2 = 8$

$n = 6$

$\left(1-\frac{2}{x}+\frac{4}{x^2}\right)^6$ Put $x = 1$

$\left(1-\frac{2}{1}+\frac{4}{1}\right)^6 = 729$ Ans (1)

**Q.18.** If the sum of the first ten---

**Sol.** $\left(\frac{8}{5}\right)^2+\left(\frac{12}{5}\right)^2+\left(\frac{16}{5}\right)^2+\left(\frac{20}{5}\right)^2+$ ----- Upto 10 ter

$\frac{4^2}{5^2}\left[2^2+3^2+4^2+5^2+\text{-----}+11^2+1^2-1\right]$

$\frac{4^2}{5^2}\left[\frac{11(11+1)(2.11+1)}{6}-1\right] = \frac{16}{25}\left[\frac{23\times 11\times 12}{6}-1\right]$

$\frac{16}{25}\left[505\right] = \frac{16}{5}[101]$ Ans [3]

$253 \times 2 = 506$

PTO

Set(G)

**Q.9** The eccentricity ------ is :

**Ans. (4)**

$2b = \frac{1}{2} \times (2ae)$

$\frac{b}{a} = \frac{e}{2}$. $e = \sqrt{1+\frac{b^2}{a^2}}$

$e = \sqrt{1+\frac{e^2}{4}}$

$\frac{3e^2}{4} = 1$ $\quad e = \frac{2}{\sqrt{3}}$ so option (4)

**Q.11** Let A $= \begin{bmatrix} 5a & -b \\ 3 & 2 \end{bmatrix}$ ---

**Ans. (3)**

$adj A = \begin{bmatrix} 2 & -3 \\ b & 5a \end{bmatrix}^T = \begin{bmatrix} 2 & b \\ -3 & 5a \end{bmatrix}$.

$A \cdot adj A = \begin{bmatrix} 5a & -b \\ 3 & 2 \end{bmatrix}\begin{bmatrix} 2 & b \\ -3 & 5a \end{bmatrix}$

$= \begin{bmatrix} 10a+3b & 0 \\ 0 & 10a+3b \end{bmatrix}$.

$A \cdot A^T = \begin{bmatrix} 5a & -b \\ 3 & 2 \end{bmatrix}\begin{bmatrix} 5a & 3 \\ -b & 2 \end{bmatrix} = \begin{bmatrix} 25a^2+b^2 & 15a-2b \\ 15a-2b & 13 \end{bmatrix}$

$\begin{bmatrix} 10a+3b & 0 \\ 0 & 10a+3b \end{bmatrix} = \begin{bmatrix} 25a^2+b^2 & 15a-2b \\ 15a-2b & 13 \end{bmatrix}$.

$15a - 2b = 0 \quad 15a = 2b$

$10a + 3b = 13$

$10a + 3\left(\frac{15a}{2}\right) = 13$

$65a = 26$

$a = \frac{2}{5}$. $\quad b = \frac{15a}{2} \Rightarrow \frac{15 \times 2}{2 \times 5} = 3 \quad 5a + b = 2 + 3 = 5$

PTO

Q.15 Set(G)

SMALL → ALLMS.

A → $\frac{L4}{L2}$ → 12   L → L4 = 24. M → 12.

SA → 3   SL → 6

SMALL → 12 + 24 + 12 + 3 + 6 = 57

so small will be at 58th position.

Q.16 If 2n, 5th ---

$T_2 = a + d$, $T_5 = a + 4d$   $T_9 = a + 8d$

Ans. (3)

$(a+4d)^2 = (a+d)(a+8d)$

→ $a = 8d$.

so

$T_2 = 9d$, $T_5 = 12d$, $T_9 = 16d$.

so $r = \frac{12d}{9d} = 4/3$

P.T.O

Set (G)

**Q.19** The line - - - -

$\frac{x-3}{2} = \frac{y+2}{-1} = \frac{z+4}{3}$ lies in plane $lx + my - z = 9$.

**Ans. (1)**

Point $(3, -2, -4)$ will satisfy plane.

$3l - 2y + 4 = 9$

$3l - 2m = 5$ .—(1)

& is ⊥ to normal of plane.

so

$2l - m - 3 = 0$

$2l - m = 3$ —(2)

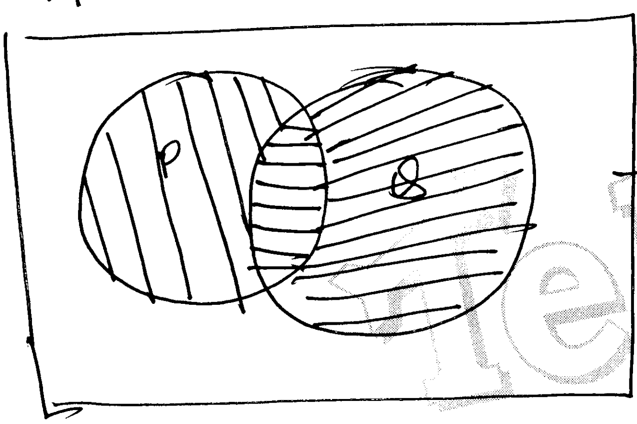
eq (1) & (2) give

$l = 1$ & $m = -1$

so $l^2 + m^2 = 2$.

**Q.20** The boolean - - - $(p \wedge \sim q) \vee q \vee (\sim p \wedge q)$

$\wedge \rightarrow \cap \quad \vee \rightarrow \cup$




$(p \wedge \sim q)$ = Ar
$(\sim p \wedge q)$ = Ar

Ans → $(p \vee q)$

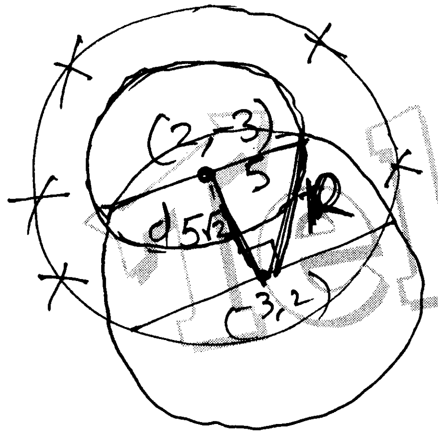
Ans (4) $(p \vee q)$

P.T.O.

Set G

Q.22. If one of the diameters of the circle ---

Sol.:




$(-3)^2 + (2)^2 - 4(-3) + 6(2) - 12$

$9 + 4 + 12 + 12 - 12$

+ve

So $(-3, 2)$ is outside

$r = \sqrt{4 + 9 + 12} = 5$

$d = \sqrt{(2-(-3))^2 + (-3-2)^2} = 5\sqrt{2}$

New $R = \sqrt{5^2 + (5\sqrt{2})^2} = \sqrt{25 + 50} = \sqrt{75}$

Ans (3) $= 5\sqrt{3}$

Q.23. $L = \lim_{n\to\infty} \left(\frac{(n+1)}{n} \cdot \frac{(n+2)}{n} \cdot \frac{(n+3)}{n} \cdots \frac{(n+2n)}{n}\right)^{1/n}$

$\log_e L = \lim_{n\to\infty} \frac{1}{n}\left(\log\frac{n+1}{n} + \log\frac{n+2}{n} + \log\left(\frac{n+3}{n}\right) + \cdots + \log\left(\frac{n+2n}{n}\right)\right)$

$\log_e L = \lim_{n\to\infty} \frac{1}{n} \sum_{r=1}^{2n} \left(\log\left(1 + \frac{r}{n}\right)\right) = \int_0^2 \log(1+x)\,dx$

$1 + x = t$

$x = t - 1$

$= \int_1^3 \ln t\,dt = \left(t \ln(t/e)\right)_1^3 = 3\ln\frac{3}{e} - \ln\frac{1}{e} = \ln\left(\frac{27}{e^3} \Big/ \frac{1}{e}\right)$

$\ln L = \ln\left(\frac{27}{e^2}\right) \Longrightarrow L = \frac{27}{e^2}$ Ans (3)

P.T.O

Set G

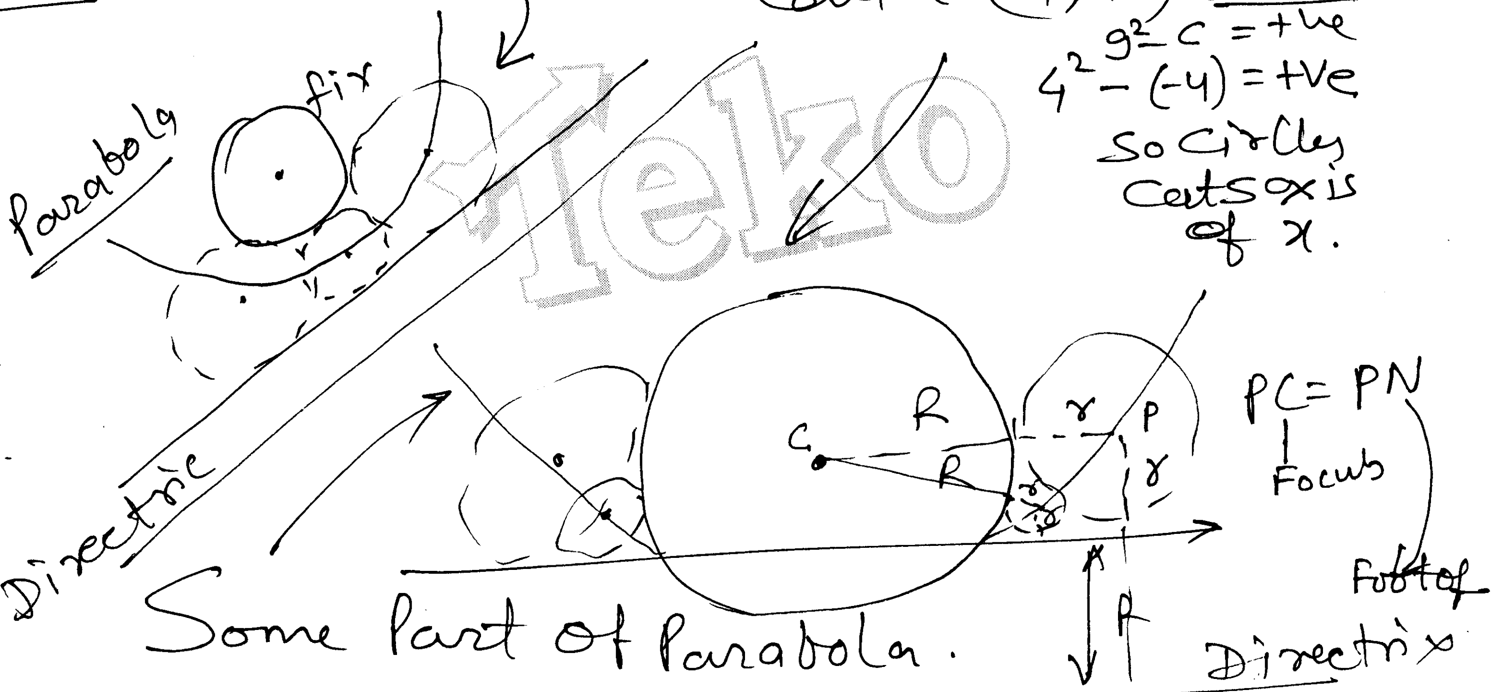
Que 24. The centres of those circles :

Sol. Class room que.

Centre (4, 4) But $g^2 - c = +ve$

$4^2 - (-4) = +ve$

So circles cuts axis of x.




Some Part of Parabola.

इशारा

Ans Parabola ही रहेगा क्योंकि Arc तो Parabola का ही Part है Ans (1)

P.T.O.

Q-25 Let $\vec{a}, \vec{b}, \vec{c}$ ---- Set (G)

$\vec{a} \times (\vec{b} \times \vec{c}) = \frac{\sqrt{3}}{2}(\vec{b} + \vec{c})$

so

$(\vec{a}\cdot\vec{c})\vec{b} - (\vec{a}\cdot\vec{b})\vec{c} = \frac{\sqrt{3}}{2}\vec{b} + \frac{\sqrt{3}}{2}\vec{c}$

Ans. (1)

$\vec{a}\cdot\vec{b} = -\frac{\sqrt{3}}{2}$

$|a||b|\cos\theta = -\frac{\sqrt{3}}{2}$

$\cos\theta = -\frac{\sqrt{3}}{2}$

$\theta = \frac{5\pi}{6}$

Q-26

$$P = \lim_{x \to 0^+} (1 + \tan^2\sqrt{x})^{\frac{1}{2x}}$$

It is $1^\infty$ case

so $\lim_{x\to 0} \frac{1}{2x}(1 + \tan^2\sqrt{x} - 1)$

$P = e^{\lim_{x\to 0} \frac{1}{2x}(1+\tan^2\sqrt{x}-1)}$

$P = e^{\frac{1}{2x}\tan^2\sqrt{x}}$

$P = e^{1/2}$ so $\log P = \frac{1}{2}$

Q.27 If $0 \le x < 2\pi$, then the number ---

Sol. $\cos 4x + \cos x + \cos 3x + \cos 2x = 0$ by counting Ans (4) = 7

$2\cos\left(\frac{5x}{2}\right)\cos\frac{3x}{2} + 2\cos\frac{5x}{2}\cdot\cos\frac{x}{2} = 0$

$2\cos\frac{5x}{2}\left[\cos\frac{3x}{2} + \cos\frac{x}{2}\right] = 2\cdot 2\cos\frac{5x}{2}\cdot\cos x\cdot\cos\frac{x}{2} = 0$

$\frac{5x}{2} = (2n+1)\frac{\pi}{2}$ & $x = (2m+1)\frac{\pi}{2}$ & $\frac{x}{2} = (2k+1)\frac{\pi}{2}$

P.T.O.

Solutions of JEE Main 2016 with in 1 hour first in INDIA April 2016 Sunday

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**Q-28**

Let (1)

$(x^2-5x+5)^{x^2+4x-60} = 1$

Three cases

① $(1)$ ⟶ $x^2+4x-60=0$ $x=-10, 6$

② $(\ldots)^0$ ⟶ $x^2-5x+5=1$ $x=1, 4$.

③ $(-1)^{\text{even}}$ ⟶ $x^2-5x+5=-1$

$x=2,3$ ⟶ at $x=2$ even, $x=3$ odd.

So $x=-10, 6, 1, 4, 2$.

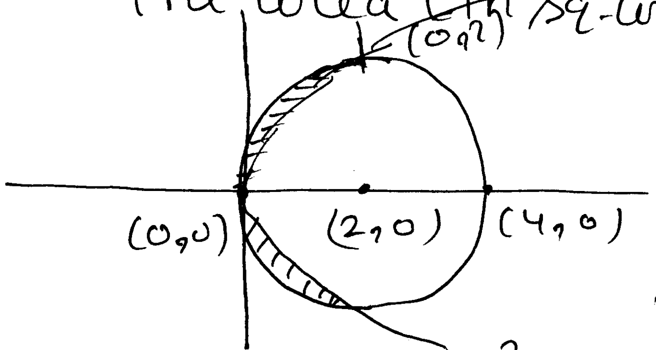
So sum $=-10+6+1+4+2$

$=3$

Ans. (2)

**Q-29**

The area (in sq-units) . . .




$$\text{area} = \frac{\pi(2)^2}{4} - 2\int_0^2 \frac{y^2}{2}\,dy$$

$$= \pi - \frac{8}{3}.$$

Ans. (3)

**Q-30**

$f(x)+2f\left(\frac{1}{x}\right)=3x$. —(i)

So

$f\left(\frac{1}{x}\right)+2f(x)=\frac{3}{x}$. —(ii)

Solving.

$f(x)=\frac{2}{x}\cdot\frac{3}{x}-x$.

$f(x)=f(-x)$ ⟶ $\frac{3}{x}-x=x-\frac{3}{x}$

$2x=\frac{6}{x}$ $x^2=3$ ⟶ $x=\pm\sqrt{3}$

Ans. (4)

Set (G)

**Q.12**

$f(x) = \tan^{-1}\sqrt{\frac{1+\sin x}{1-\sin x}}$

at $x = \pi/6$ $f(\pi/6) = \tan^{-1}\sqrt{3} = \pi/3$

**Ans. (3)**

now

$y = \tan^{-1}\sqrt{\frac{1+\sin x}{1-\sin x}} \Rightarrow \tan y = \sqrt{\frac{1+\sin x}{1-\sin x}}$

$\tan^2 y = \frac{1+\sin x}{1-\sin x}$.

$2\tan y \sec^2 y\, y' = \frac{2\cos x}{(1-\sin x)^2}$.

$2\sqrt{3} \times 4 y' = 4\sqrt{3} \Rightarrow y' = \frac{1}{2}$.

Slope of normal $= -2$

eqn $\left(y - \frac{\pi}{3}\right) = -2\left(x - \frac{\pi}{6}\right)$

$y + 2x = \frac{\pi}{3} + \frac{\pi}{3}$

$y + 2x = \frac{2\pi}{3}$.

**Q.14**

If a curve ----

**Ans. (1)**

$y(1+xy)dx = x\,dy \rightarrow \frac{dy}{dx} = \frac{y}{x} + y^2$.

$\frac{1}{y^2}\frac{dy}{dx} - \frac{1}{yx} = 1$.

Let $-1/y = z$.

$\frac{dz}{dx} + \frac{z}{x} = 1$

$x\frac{dz}{dx} + z = x$.

$xz = \frac{x^2}{2} + c$.

at $x = 1$ $y = -1 \Rightarrow c = \frac{1}{2}$

$xz = \frac{x^2}{2} + \frac{1}{2}$

at $x = -\frac{1}{2}$ $y = 4/5$