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SET (G₁)

Q-1 A value of θ ----- is,
Solⁿ: for z to be purely imaginary

Ans.
(1)

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

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

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

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.

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

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

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

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SET (G1)

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

Solⁿ: Let λ part goes to square
then $\rightarrow (2-\lambda)$ goes to circle.

Ans. (u)

$$\text{So } 4x = \lambda \quad \& \quad 2\pi r = 2-\lambda$$

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

$$A = A_1 + A_2$$

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

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

So Minimum

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

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

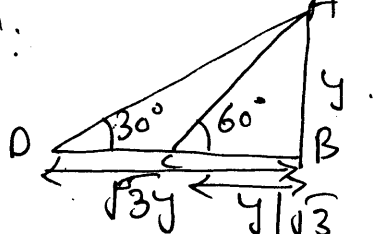
$$\rightarrow \frac{\lambda}{2} = 2\left(\frac{2-\lambda}{2\pi}\right) \times \frac{2}{2}$$

$$2\lambda = 4\pi$$

$$\lambda = 2\pi \text{ so option (u)}$$

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

Solⁿ:



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

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

$$\text{for } B.C \rightarrow \frac{y}{\sqrt{3}} \rightarrow 5 \text{ min}$$

PTQ

(अन्य 244121 CONCEPT)

so option (u)

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Q.5 Set (G)
Let two true --- 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

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

Ans. (3) so $\text{var}(x) = \sigma^2 = \frac{49}{4}$

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

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

which gives.

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

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Set G

Q.7. For $x \in \mathbb{R}$ $f(x) = |\log_2 \sin x|$.

Ans: (3)

$$f(x) = \log_2 \sin x. \text{ for } x \in (0^+ \text{ or } 0^-)$$

$$g(x) = f(\log_2 \sin x)$$

$$g(x) = \log_2 \sin(\log_2 \sin x)$$

$$g'(x) = \frac{1}{\log_2 \sin x} \cdot \cos(\log_2 \sin x)$$

$$g'(0) = \frac{1}{\log_2 2}$$

Hence, option 3 is correct

Q-11
Ans (3)

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

$$A + dA = A \cdot A^T$$

$$A + dA = |A| I_n$$

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

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

$$a = \frac{3}{5} \text{ Put in (1)}$$

$$b = 3$$

$$15a - 2b = 0 \quad (1)$$

$$25a^2 + b^2 = 10a + 3b \quad (2)$$

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

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SET(G)

Q29 The area (sq.) is:-
Ans(3)

$$y^2 \geq 2x$$

$$x \geq 0$$

$$y \geq 0$$

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

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

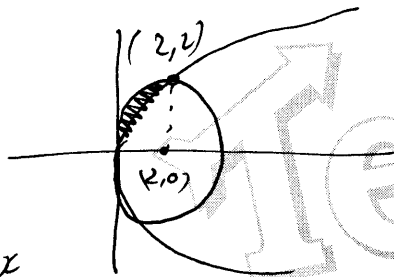
$$\text{Req. Area} = \frac{1}{4} \pi R^2 - \int_0^2 \sqrt{2x} \, dx$$

$$= \frac{1}{4} \pi (4) - \left[\frac{2\sqrt{2}}{3} x^{3/2} \right]_0^2$$

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

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

∴ Ans option (3)



SET(G)

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Q30 If $f(x) \dots \dots$ then S:-
Ans(3)

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

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

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

$$2 \times (2) - (1)$$

$$3f\left(\frac{1}{x}\right) = \frac{6}{x} - 3x$$

$$f\left(\frac{1}{x}\right) = \frac{2}{x} - x = \frac{2-x^2}{x}$$

$$S \Rightarrow f(x) = f\left(\frac{1}{x}\right)$$

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

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

∴ ans option (4)

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Q.8

$$P(1, -5, 9)$$

$$L \rightarrow \frac{x}{1} = \frac{y}{-5} = \frac{z}{9}$$

Plane: $x - y + z = 5$

Equation of Line

which passes through $(1, -5, 9)$ & \perp to L .

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

$$\text{So } x = \lambda + 1$$

$$y = -\lambda - 5$$

$$z = \lambda + 9$$

Intersection with plane gives

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

$$\text{So } Q \rightarrow (-9, -15, -1) \quad \lambda = -10$$

$$PQ = \sqrt{(1+9)^2 + (-15+5)^2 + (-1-9)^2} \\ = 10\sqrt{3} \text{ So option (3)}$$

Q.21.

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

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

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

Ans (3)

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Set G

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

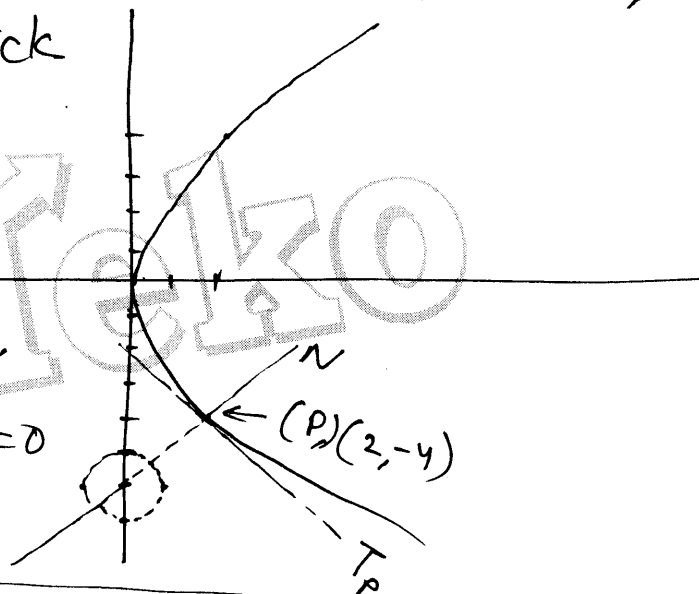
Suhag Short Trick

$P \rightarrow (2, -4)$

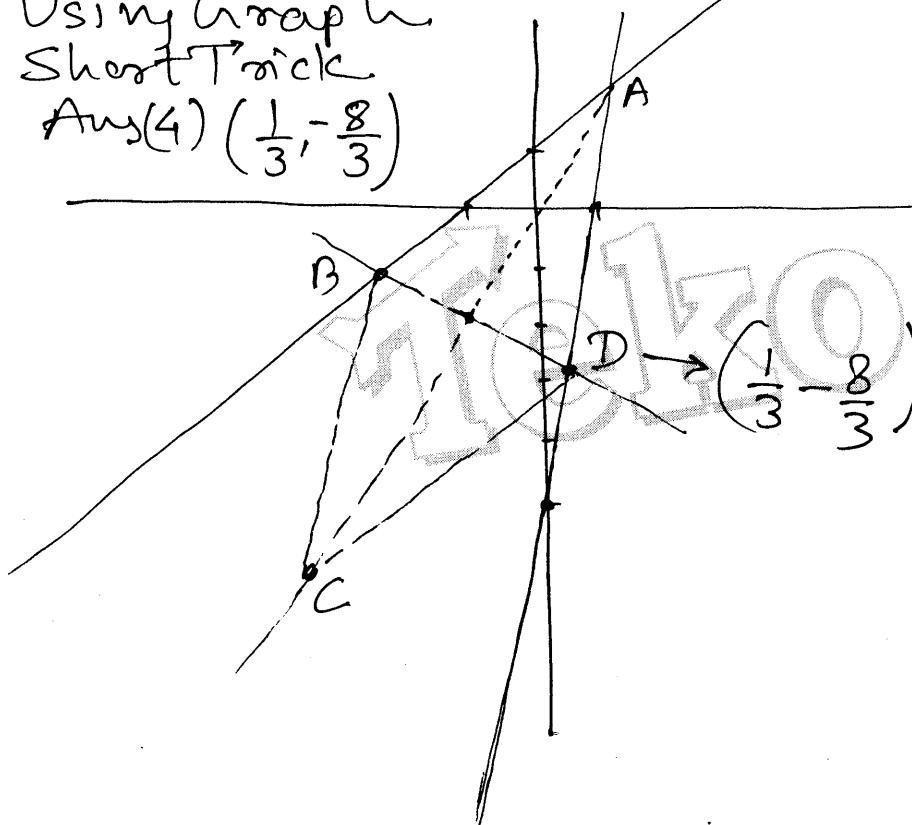
in options only
(2) is with

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) $(\frac{1}{3}, -\frac{8}{3})$



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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

$$\begin{aligned} n+3-1 &= 28 \text{ given} \\ n+2 &= 28 \\ \frac{(n+2)(n+1)}{2} &= 28 \\ (n+2)(n+1) &= 56 = 8 \times 7 \\ n+2 &= 8 \\ n &= 6 \\ \left(1 - \frac{2}{x} + \frac{4}{x^2}\right)^6 & \text{ Put } x=1 \\ \left(1 - \frac{2}{1} + \frac{4}{1}\right)^6 &= 729 \text{ Ans (1)} \end{aligned}$$

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

Sol. $\left(\frac{8}{5}\right)^2 + \left(\frac{12}{5}\right)^2 + \left(\frac{16}{5}\right)^2 + \left(\frac{20}{5}\right)^2 + \dots$ Up to 10 terms

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

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

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

$$\begin{array}{r} 253 \\ \times 2 \\ \hline 506 \end{array}$$

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Set (G)

Q-9 The eccentricity ----- is :

Ans. $2b = \frac{1}{2} \times (2ac)$

(4) $\frac{b}{a} = \frac{c}{2} \cdot e = \sqrt{1 + \frac{b^2}{a^2}}$

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

$\frac{3c^2}{4} = 1$

$e = \frac{2}{\sqrt{3}}$

so option (4)

Q-10

Q-11 Let $A = \begin{bmatrix} sa & -b \\ 3 & 2 \end{bmatrix}$ ---

$\text{adj} A = \begin{bmatrix} 2 & -3 \\ b & sa \end{bmatrix}^T = \begin{bmatrix} 2 & b \\ -3 & sa \end{bmatrix}$

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

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

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

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

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

$10a+3b=13$

$10a+3(15a) = 13$

$65a = 13$
 $a = \frac{13}{65}$

$b = \frac{15a}{2} \Rightarrow \frac{15 \times 13}{2 \times 65} = \frac{3}{2}$
 $sa+b = 2+3=5$

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Q-15

Set (G)

SMALL \rightarrow ALLMS.

$A \rightarrow \frac{L}{12} \rightarrow 12$ $L \rightarrow L = 24$ $M \rightarrow 12$.

$SA \rightarrow 3$ $SL \rightarrow 6$

SMALL $\rightarrow 12 + 24 + 12 + 3 + 6$

so small = 57
will be at 58th position.

Q-16

If 2^n , 5th - - -

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

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

so $a = 8d$.

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

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

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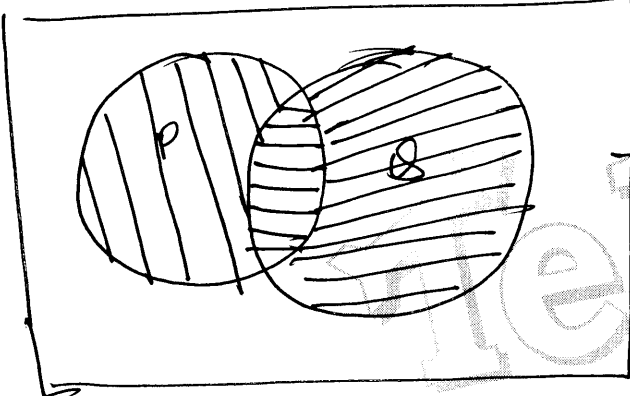



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Q.19
Ans.
(1)

Set (C)
The line $\frac{x-3}{2} = \frac{y+2}{-1} = \frac{z+4}{3}$ lies in plane $lx + my - z = 9$.
Point $(3, -2, -4)$ will satisfy plane.
 $3l - 2m + 4 = 9$
 $3l - 2m = 5$ — (1)
& is \perp 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 $(p \wedge \sim q) \vee q \vee (\sim p \wedge q)$
 $1 \rightarrow \cap \quad \vee \rightarrow \cup$

 $(p \wedge \sim q) = A_r$ 
 $(\sim p \wedge q) = A_r$ 
 $(p \vee q)$ 
Ans (4) $(p \vee q)$

P.T.O.

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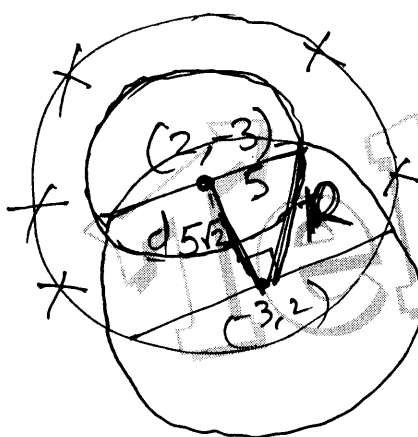
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Set C

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

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

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

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

$$\text{Ans(3)} = \frac{5\sqrt{3}}{2}$$

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

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

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

$$= \int_1^3 \log t dt = \left(t \log \left(\frac{t}{e} \right) \right)_1^3 = 3 \log \frac{3}{e} - \log \frac{1}{e} = \log \left(\frac{27}{e^2} \right)$$

$$\ln L = \ln \left(\frac{27}{e^2} \right) \Rightarrow L = \frac{27}{e^2} \text{ Ans(3) p.T.O.}$$

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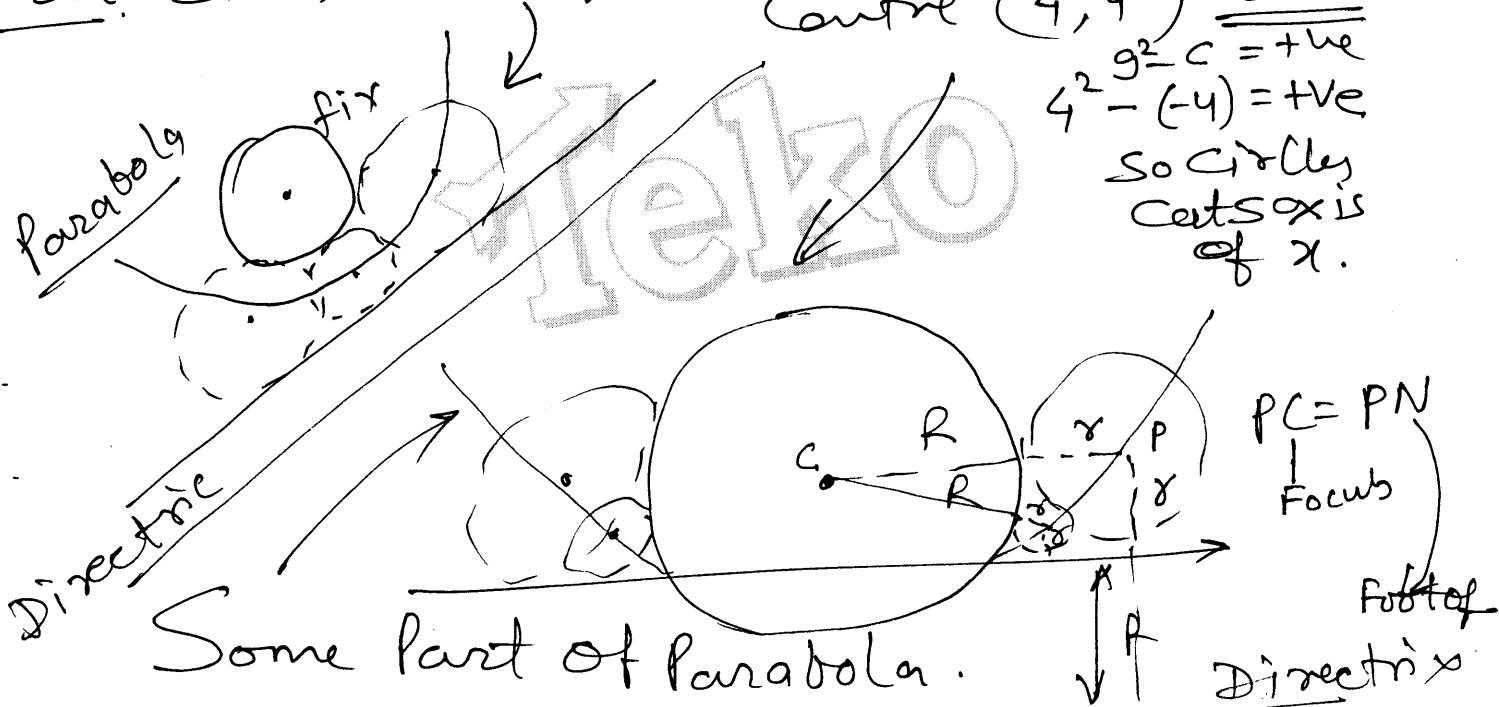
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Set G

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
cut x axis
of x .



EMIRI

Ans Parabola ki shuru ki part ki Arc ki parabola ki ki part ki Ans (1)

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Q-25 Let $\vec{a}, \vec{b}, \vec{c}$ ---
 $\vec{a} \times (\vec{b} \times \vec{c}) = \frac{\sqrt{3}}{2} (\vec{b} * \vec{c})$
 Ans. (1)
 $(\vec{a} \cdot \vec{c}) \vec{b} - (\vec{a} \cdot \vec{b}) \vec{c} = \frac{\sqrt{3}}{2} \vec{b} + \frac{\sqrt{3}}{2} \vec{c}$
 $\vec{a} \cdot \vec{b} = -\frac{\sqrt{3}}{2}$
 $|\vec{a}| |\vec{b}| \cos \theta = -\frac{\sqrt{3}}{2}$
 $\cos \theta = -\frac{\sqrt{3}}{2}$
 $\theta = \frac{5\pi}{6}$

Q-26
 $P = \lim_{x \rightarrow 0^+} (1 + \tan^2 \sqrt{x})^{\frac{1}{2x}}$
 It is 1^∞ case
 So $\lim_{x \rightarrow 0^+} \frac{1}{2x} (1 + \tan^2 \sqrt{x} - 1)$
 $P = e$
 $P = e^{\frac{1}{2x} \tan^2 \sqrt{x}}$
 $P = e^{1/2}$ so $\log P = \frac{1}{2}$

Q-27 If $0 \leq x < 2\pi$, then the number ---
 Sol. $\cos 4x + \cos x + \cos 3x + \cos 2x = 0$ by counting
 $2 \cos \frac{5x}{2} \cos \frac{3x}{2} + 2 \cos \frac{5x}{2} \cos \frac{x}{2} = 0$ Any (4) = 7
 $2 \cos \frac{5x}{2} \left[\cos \frac{3x}{2} + \cos \frac{x}{2} \right] = 2 \cdot 2 \cos \frac{5x}{2} \cos x \cos \frac{x}{2} = 0$
 $\frac{5x}{2} = (2n+1)\frac{\pi}{2}$ & $x = (2m+1)\frac{\pi}{2}$ & $\frac{x}{2} = (2k+1)\frac{\pi}{2}$
 P.T.O.

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Q-28

Let (r) $(x^2 - 5x + 5) \cdot x^2 + 4x - 60 = 1$

Three cases

① (1) $\rightarrow x^2 + 4x - 60 = 0 \quad x = -10, 6$

② (---) $\rightarrow x^2 - 5x + 5 = 1 \quad x = 1, 4$

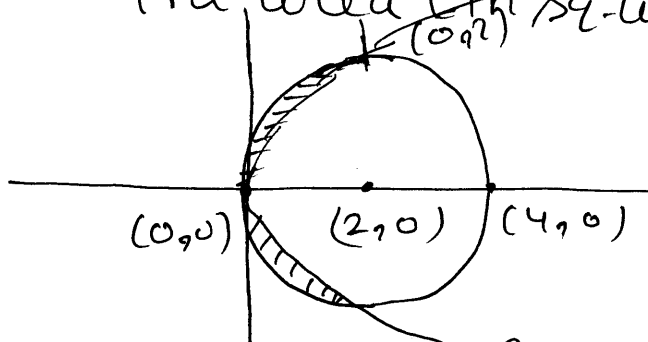
③ (-1) even $\rightarrow x^2 - 5x + 5 = -1$
 $x = 2, 3$

so $x = -10, 6, 1, 4, 2, 3$
at $x = 2$ even
 $x = 3$ odd.

so sum = $-10 + 6 + 1 + 4 + 2$
 $= 3$

Q-29

The area (in sq. units) - -



area = $\frac{\pi (2)^2}{4} - 2 \int_0^2 \frac{y^2}{2} dy$
 $= \pi - \frac{8}{3}$

Q-30

Ans.
(4)

$+(x) + 2 + (\frac{1}{x}) = 3x \quad \text{--- (i)}$

so $+(\frac{1}{x}) + 2 + (x) = \frac{3}{x} \quad \text{--- (ii)}$

Solving.

$+(x) = \frac{3}{x} - x$

$+(x) = +(\frac{3}{x}) \rightarrow \frac{3}{x} - x = x - \frac{3}{x}$
 $2x = \frac{6}{x} \quad x^2 = 3 \rightarrow x = \pm \sqrt{3}$

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Q.12

Let (α)
 $f(x) = \tan^{-1} \sqrt{\frac{1+\sin x}{1-\sin x}}$
 at $x = \pi/6$ $f(\pi/6) = \tan^{-1} \sqrt{3} = \pi/3$
 Now
 $y = \tan^{-1} \sqrt{\frac{1+\sin x}{1-\sin x}} \Rightarrow \tan y = \sqrt{\frac{1+\sin x}{1-\sin x}}$

Ans.
(3)

$\tan^2 y = \frac{1+\sin x}{1-\sin x}$
 $2 \tan y \sec^2 y \cdot y' = \frac{2 \cos x}{(1-\sin x)^2}$
 $2 \sqrt{3} \times 4 y' = 4 \sqrt{3} \Rightarrow y' = \frac{1}{2}$
 So slope of normal = -2
 eqn $(y - \frac{\pi}{3}) = -2(x - \frac{\pi}{6})$
 $y + 2x = \frac{\pi}{3} + \frac{\pi}{3}$
 $y + 2x = \frac{2\pi}{3}$

Q.14

Ans.
(1)

dy If a curve ----
 $y(1+xy)dx = xdy \rightarrow \frac{dy}{dx} = \frac{y}{x} + y^2$
 $\frac{1}{y^2} \frac{dy}{dx} - \frac{1}{yx} = 1$
 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 $x = -\frac{1}{2}, y = 4/5$