

SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

CLASS : XIth

DATE :

Solutions

SUBJECT : MATHS

DPP NO. : 1

Topic :- CONIC SECTION

1 (d)

The circle $x^2 + y^2 + 2gx + 2fy + c = 0$ cuts an intercept of length $2\sqrt{f^2 - c}$ on y-axis.

For the circle $x^2 + y^2 + 4x - 7y + 12 = 0$, we have

$g = 2, f = -7/2$ and $c = 12$

$$\therefore y - \text{intercept} = 2\sqrt{f^2 - c} = 2\sqrt{\frac{49}{4} - 12} = 1$$

2 (a)

$$\therefore \text{Eccentricity of ellipse} = \sqrt{1 - \frac{b^2}{a^2}} = \sqrt{1 - \frac{3}{4}} = \frac{1}{2}$$

$\therefore$ Eccentricity of hyperbola = 2

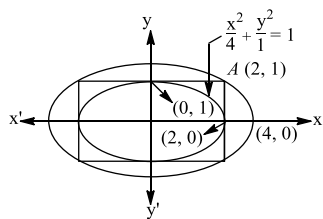
$$\Rightarrow \sqrt{1 + \frac{b^2}{64}} \Rightarrow 2$$

$$\Rightarrow 4 = 1 + \frac{b^2}{64} \Rightarrow 192 = b^2$$

3 (a)

Let the equation of the required ellipse be $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$

But the ellipse passes through the point (2,1)



$$\Rightarrow \frac{1}{4} + \frac{1}{b^2} = 1$$

$$\Rightarrow \frac{1}{b^2} = \frac{3}{4} \Rightarrow b^2 = \frac{4}{3}$$

Hence, equation is

$$\frac{x^2}{16} + \frac{3y^2}{4} = 1$$

$$\Rightarrow x^2 + 12y^2 = 16$$

4 **(b)**

We have,

$$x = 2t + 1, y = t^2 + 2$$

$$\Rightarrow y = \left(\frac{x-1}{2}\right)^2 + 2$$

$$\Rightarrow (x-1)^2 = 4(y-2)$$

The equation of the directrix of this parabola is

$$y - 2 = -1 \text{ or, } y = 1 \quad [\text{Using } y = -a]$$

5 **(c)**

Given equation can be rewritten as

$$y^2 = \frac{4k}{4} \left(x - \frac{8}{k}\right)$$

The standard equation of parabola is

$$Y^2 = 4AX, \text{ where } A = \frac{k}{4}$$

$$\therefore \text{Equation of directrix is } X + \frac{k}{4} = 0$$

$$\Rightarrow x - \frac{8}{k} + \frac{k}{4} = 0$$

But the given equation of directrix is $x - 1 = 0$

Since, both equations are same

$$\therefore \frac{8}{k} - \frac{k}{4} = 1$$

$$\Rightarrow 32 - k^2 = 4k \Rightarrow k = -8, 4$$

6 **(d)**

The equation of the ellipse is

$$3(x+1)^2 + 4(y-1)^2 = 12 \text{ or, } \frac{(x+1)^2}{2^2} + \frac{(y-1)^2}{(\sqrt{3})^2} = 1$$

The equations of its major and minor axes are $y - 1 = 0$ and $x + 1 = 0$ respectively

7 **(a)**

Let mid point of the chord be (h, k) , then equation of the chords be

$$\frac{hx^2}{a^2} + \frac{ky^2}{b^2} - 1 = \frac{h^2}{a^2} + \frac{k^2}{b^2} - 1$$

$$\Rightarrow y = -\frac{b^2}{a^2} \cdot \frac{h}{k} x + \left(\frac{h^2}{a^2} + \frac{k^2}{b^2}\right) \frac{b^2}{k} \quad \dots(i)$$

Since, line (i) is touching the circle $x^2 + y^2 = c^2$

$$\therefore \left(\frac{h^2}{a^2} + \frac{k^2}{b^2} \right) \frac{b^4}{k^2} = c^2 \left(1 + \frac{b^4 h^2}{a^4 k^2} \right)$$

Hence, locus is $(b^2 x^2 + a^2 y^2)^2 = c^2 (b^4 x^2 + a^4 y^2)$

8 (c)

Given curve is $y^2 = 4x$... (i)

Let the equation of line be $y = mx + c$

Since, $\frac{dy}{dx} = m = 1$ and above line is passing through the point $(0, 1)$

$$1 = 1(0) + c \Rightarrow c = 1$$

$$y = x + 1 \quad \dots (ii)$$

On solving Eqs. (i) and (ii), we get

$$x = 1 \text{ and } y = 2$$

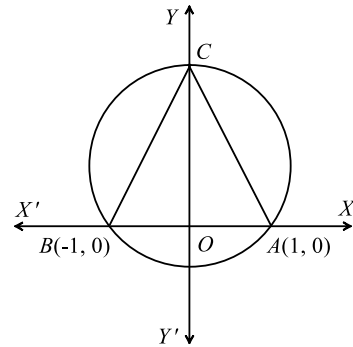
This shows that line touch the curve at one point. So, length of intercept is zero.

9 (c)

We have, $AB = 2$

Since ΔABC is equilateral. Therefore,

$$AC = BC = 2 \text{ and } OC = \frac{\sqrt{3}}{2} (\text{Side}) = \sqrt{3}$$



Thus, the coordinates of C are $(0, \sqrt{3})$

Let the circumcircle of ΔABC be

$$x^2 + y^2 + 2gx + 2fy + c = 0$$

It passes through $(1, 0)$, $(-1, 0)$ and $(0, \sqrt{3})$

$$\therefore 1 + 2g + c = 0, 1 - 2g + c = 0 \text{ and } 3 + 2\sqrt{3}f + c = 0$$

Solving these three equations, we get

$$g = 0, c = -1 \text{ and } f = -\frac{1}{\sqrt{3}}$$

Thus, the equation of the circumcircle is

$$x^2 + y^2 - \frac{2}{\sqrt{3}}y - 1 = 0$$

10 (c)

The coordinates of P be (h, k)

Let the equation of a tangent from $P(h, k)$ to the circle

$$x^2 + y^2 = a^2 \text{ be } y = mx + a\sqrt{1+m^2}$$

Since $P(h, k)$ lies on $y = mx + a\sqrt{1+m^2}$

$$\therefore k = mh + a\sqrt{1+m^2}$$

$$\Rightarrow (k - mh)^2 = a^2(1+m^2)$$

$$\Rightarrow m^2(h^2 - a^2) - 2mkh + k^2 - a^2 = 0$$

This is a quadric in m . Let the two roots be m_1 and m_2 . Then,

$$m_1 + m_2 = \frac{2hk}{h^2 - a^2}$$

But, $\tan \alpha = m_1$, $\tan \beta = m_2$ and it is given that

$$\cot \alpha + \cot \beta = 0$$

$$\Rightarrow \frac{1}{m_1} + \frac{1}{m_2} = 0 \Rightarrow m_1 + m_2 = 0 \Rightarrow \frac{2hk}{h^2 - a^2} = 0 \Rightarrow hk = 0$$

Hence, the locus of (h, k) is $xy = 0$

11 (b)

We have,

$$x = 2 + t^2, y = 2t + 1$$

$$\Rightarrow x - 2 = t^2 \text{ and } y - 1 = 2t$$

$$\Rightarrow (y - 1)^2 = 4t^2 \text{ and } x - 2 = t^2$$

$$\Rightarrow (y - 1)^2 = 4(x - 2),$$

Which is a parabola with vertex at $(2, 1)$

12 (b)

Given equation of ellipse is

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 (a < b)$$

It is a vertical ellipse with foci $(0, \pm be)$

Equation of any tangent line to the above ellipse is

$$y = mx + \sqrt{a^2m^2 + b^2}$$

$\therefore$ Required product

$$= \left| \frac{-be + \sqrt{a^2m^2 + b^2}}{\sqrt{m^2 + 1}} \right| \left| \frac{be + \sqrt{a^2m^2 + b^2}}{\sqrt{m^2 + 1}} \right|$$

$$= \left| \frac{a^2m^2 + b^2 - b^2e^2}{m^2 + 1} \right|$$

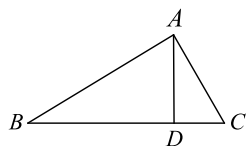
$$= \left| \frac{a^2m^2 + b^2(1 - e^2)}{m^2 + 1} \right|$$

$$= \left| \frac{a^2m^2 + a^2}{m^2 + 1} \right| \quad [\because a^2 = b^2(1 - e^2)]$$

$$= a^2$$

13 (b)

Since, $\angle ADB = \angle ADC = 90^\circ$, circle on AB and AC as diameters pass through D and therefore the altitude AD is the common chord. Similarly, the other two common chords are the other two altitudes and hence they concur at the orthocenter



14 (b)

Given equation of ellipse can be rewritten as

$$\frac{(x-2)^2}{25} + \frac{(y+3)^2}{16} = 1 \Rightarrow \frac{X^2}{25} + \frac{Y^2}{16} = 1$$

Where $X = x - 2, Y = y + 3$

Here, $a > b$

$$\therefore e = \sqrt{1 - \frac{b^2}{a^2}} = \sqrt{1 - \frac{16}{25}} = \frac{3}{5}$$

$\therefore$ Focus $(\pm ae, 0) = (\pm 3, 0)$

$$\Rightarrow x - 2 = \pm 3, y + 3 = 0$$

$$\Rightarrow x = 5, -1, y = -3$$

$\therefore$ Foci are $(-1, -3)$ and $(5, -3)$

Distance between $(2, -3)$ and $(-1, -3)$

$$= \sqrt{(2+1)^2 + (-3+3)^2} = 3$$

and distance between $(2, -3)$ and $(5, -3)$

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

Hence, sum of the distance of point $(2, -3)$ from the foci

$$= 3 + 3 = 6$$

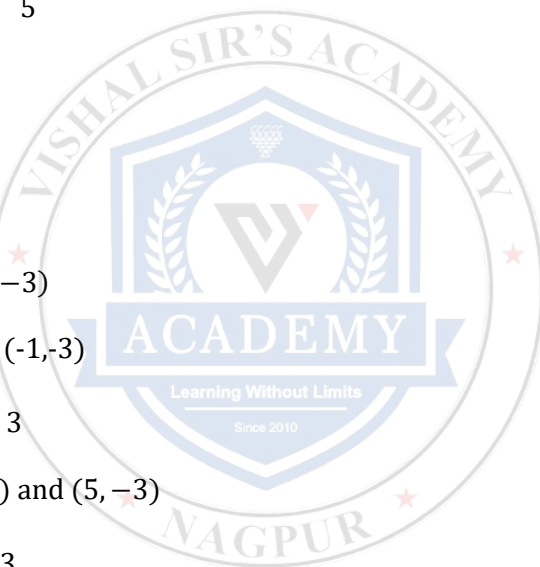
15 (c)

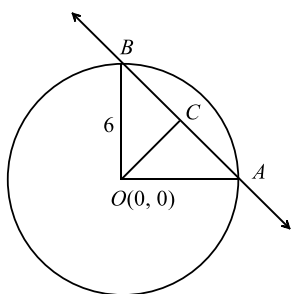
We have,

OC = Length of the perpendicular from $(0,0)$ on the line $3x + 4y - 15 = 0$

$$\Rightarrow OC = \frac{15}{\sqrt{3^2 + 4^2}} = 3$$

$$\therefore AB = 2 AC = 2\sqrt{OA^2 - OC^2} = 2\sqrt{36 - 9} = 6\sqrt{3}$$





16 (a)

We know that the normal at $(at_1^2, 2at_1)$ meets the parabola at $(at_2^2, 2at_2)$, if $t_2 = -t_1 - \frac{2}{t_1}$

Here, the normal is drawn at (x_1, x_1)

$$\therefore at_1^2 = 2at_1 \Rightarrow t_1 = 2 \Rightarrow t_2 = -2 - \frac{2}{2} = -3$$

The coordinates of the end points of the normal chord are $P(4a, 4a)$ and $Q(9a, -6a)$

Clearly, PQ makes a right angle at the focus $(a, 0)$

17 (a)

The equation of the family of circles touching $2x - y - 1 = 0$ at $(3, 5)$ is

$$(x - 3)^2 + (y - 5)^2 + \lambda(2x - y - 1) = 0 \quad \dots(i)$$

It has its centre $\left(-\lambda + 3, \frac{\lambda + 10}{2}\right)$ on the line $x + y = 5$

$$\therefore -\lambda + 3 + \frac{\lambda + 10}{2} = 5 \Rightarrow \lambda = 6$$

Putting $\lambda = 6$ in (i), we get

$$x^2 + y^2 + 6x - 16y + 28 = 0$$

As the equation of the required circle

18 (d)

Given that equation of parabola is $y^2 = 9x$

On comparing with $y^2 = 4ax$, we get $a = \frac{9}{4}$

Now, equation of tangent to the parabola $y^2 = 9x$ is

$$y = mx + \frac{9/4}{m} \quad \dots(i)$$

If this tangent passing through the point $(4, 10)$, then

$$10 = 4m + \frac{9}{4m}$$

$$\Rightarrow 16m^2 - 40m + 9 = 0$$

$$\Rightarrow (4m - 9)(4m - 1) = 0$$

$$\Rightarrow m = \frac{1}{4}, \frac{9}{4}$$

On putting the values of m in Eq. (i)

$$4y = x + 36 \text{ and } 4y = 9x + 4$$

$$\Rightarrow x - 4y + 36 = 0 \text{ and } 9x - 4y + 4 = 0$$

19 (a)

$$\text{Required length} = y\text{-intercept} = 2\sqrt{\frac{9}{4}} - 2 = 1$$

20 **(b)**

Given equation is $xy = a$

On differentiating, we get

$$x \frac{dy}{dx} + y = 0$$

$$\Rightarrow \frac{dy}{dx} = -\frac{y}{x}$$

$$\Rightarrow \left(\frac{dy}{dx} \right)_{(a,1)} = -\frac{1}{a}$$



ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	D	A	A	B	C	D	A	C	C	C
Q.	11	12	13	14	15	16	17	18	19	20
A.	B	B	B	B	C	A	A	D	A	B



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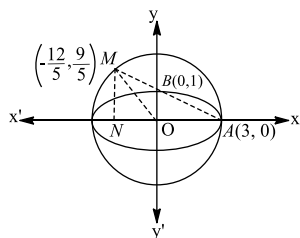
DPP NO. : 2

Topic :- CONIC SECTION

2 (d)

Equation of auxiliary circle is

$$x^2 + y^2 = 9 \quad \dots (i)$$



Equation of AM is $\frac{x}{3} + \frac{y}{1} = 1 \quad \dots (ii)$

On solving Eqs. (i) and (ii), we get $M\left(-\frac{12}{5}, \frac{9}{5}\right)$

Now, area of $\Delta AOM = \frac{1}{2} \cdot OA \times MN$

$$= \frac{27}{10} \text{ sq unit}$$

3 (d)

Equation of tangent to $y^2 = 4x$ is $y = mx + \frac{1}{m}$

Since, tangent passes through $(-1, -6)$

$$\therefore -6 = -m + \frac{1}{m} \Rightarrow m^2 - 6m - 1 = 0$$

Here, $m_1 m_2 = -1$

$\therefore$ Angle between them is 90°

4 (b)

The equation of the ellipse is

$$4(x^2 + 4x + 4) + 9(y^2 - 2y + 1) = 36 \Rightarrow \frac{(x+2)^2}{3^2} + \frac{(y-1)^2}{2^2} = 1$$

So, the coordinates of the centre are $(-2, 1)$

5 **(c)**

The two circles are

$$x^2 + y^2 - 2ax + c^2 = 0 \text{ and } x^2 + y^2 - 2by + c^2 = 0$$

Centres and radii of these two circles are :

$$\text{Centres : } C_1(a, 0) \quad C_2(0, b)$$

$$\text{Radii : } r_1 = \sqrt{a^2 - c^2} \quad r_2 = \sqrt{b^2 - c^2}$$

Since the two circles touch each other externally.

$$\therefore C_1C_2 = r_1 + r_2$$

$$\Rightarrow \sqrt{a^2 + b^2} = \sqrt{a^2 - c^2} + \sqrt{b^2 - c^2}$$

$$\Rightarrow a^2 + b^2 = a^2 - c^2 + b^2 - c^2 + 2\sqrt{a^2 - c^2}\sqrt{b^2 - c^2}$$

$$\Rightarrow c^4 = a^2b^2 - c^2(a^2 + b^2) + c^4$$

$$\Rightarrow a^2b^2 = c^2(a^2 + b^2) \Rightarrow \frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c^2}$$

6 **(a)**

It is given that $2ae = 8$ and $\frac{2a}{e} = 25$

$$\Rightarrow 2ae \times \frac{2a}{e} = 8 \times 25 \Rightarrow 4a^2 = 200 \Rightarrow a = 5\sqrt{2} \Rightarrow 2a = 10\sqrt{2}$$

7 **(c)**

Equation of chord joining points $P(a \cos \alpha, b \sin \alpha)$ and $Q(a \cos \beta, b \sin \beta)$ is

$$\frac{x}{a} \cos \left(\frac{\alpha + \beta}{2} \right) + \frac{y}{b} \sin \left(\frac{\alpha + \beta}{2} \right) = \cos \left(\frac{\alpha - \beta}{2} \right)$$

Now, $\beta = \alpha + 90^\circ$

$$\frac{x}{a} \cos \left(\frac{2\alpha + 90^\circ}{2} \right) + \frac{y}{b} \sin \left(\frac{2\alpha + 90^\circ}{2} \right) = \frac{1}{\sqrt{2}}$$

now, compare it with $lx + my = -n$, we get

$$\frac{\cos \left(\frac{2\alpha + 90^\circ}{2} \right)}{al} = \frac{\sin \left(\frac{2\alpha + 90^\circ}{2} \right)}{bm} = -\frac{1}{\sqrt{2}n}$$

$$\therefore \cos^2 \theta + \sin^2 \theta = 1$$

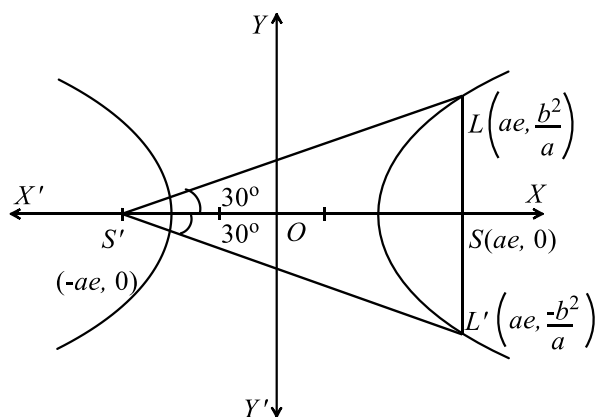
$$\Rightarrow a^2l^2 + b^2m^2 = 2n^2$$

8 **(c)**

Let LSL'' be a latusrectum and C be the centre of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$. It is given that CLL'' is equilateral triangle. Therefore, $\angle LCS = 30^\circ$

In $\triangle CSL$, we have

$$\tan 30^\circ = \frac{SL}{CS}$$



$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{b^2/a}{ae}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{b^2}{a^2 e}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{e^2 - 1}{e} \Rightarrow \sqrt{3} e^2 - e - \sqrt{3} = 0 \Rightarrow e = \frac{1 + \sqrt{13}}{2\sqrt{3}}$$

9 (c)

Given equation can be rewritten as

$$\Rightarrow 4(x^2 - 6x + 9) + 16(y^2 - 2y + 1) - 36 - 6 = 1$$

$$\Rightarrow \frac{(x-3)^2}{\frac{53}{4}} + \frac{(y-1)^2}{\frac{53}{16}} = 1$$

Here, $a^2 = \frac{53}{4}$ and $b^2 = \frac{53}{16}$

$\therefore$ Eccentricity of ellipse is $e = \frac{\sqrt{a^2 - b^2}}{a^2}$

$$\Rightarrow e = \frac{\sqrt{\frac{53}{4} - \frac{53}{16}}}{\frac{53}{4}}$$

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

10 (d)

The equation of hyperbola is

$$4x^2 - 9y^2 = 36$$

$$\Rightarrow \frac{x^2}{9} - \frac{y^2}{4} = 1 \dots(i)$$

The equation of the chords of contact of tangents from (x_1, y_1) and (x_2, y_2) to the given hyperbola are

$$\frac{x x_1}{9} - \frac{y y_1}{4} = 1 \quad \dots(ii)$$

$$\text{and } \frac{x x_2}{9} - \frac{y y_2}{4} = 1 \quad \dots(iii)$$

Lines (ii) and (iii) are at right angles.

$$\therefore \frac{9}{4} \cdot \frac{x_1}{y_1} \times \frac{4}{9} \cdot \frac{x_2}{y_2} = -1$$

$$\Rightarrow \frac{x_1 x_2}{y_1 y_2} = -\left(\frac{9}{4}\right)^2 = -\frac{81}{16}$$

11 **(a)**

The circle having centre at the radical centre of three given circles and radius equal to the length of the tangent from it to any one of three circles cuts all the three circles orthogonally. The given circles are

$$x^2 + y^2 - 3x - 6y + 14 = 0 \quad \dots(i)$$

$$x^2 + y^2 - x - 4y + 8 = 0 \quad \dots(ii)$$

$$x^2 + y^2 + 2x - 6y + 9 = 0 \quad \dots(iii)$$

The radical axes of (i), (ii) and (ii), (iii) are respectively

$$x + y - 3 = 0 \quad \dots(iv)$$

$$\text{and } 3x - 2y + 1 = 0 \quad \dots(v)$$

Solving (iv) and (v), we get $x = 1, y = 2$

Thus, the coordinates of the radical centre are (1,2)

The length of the tangent from (1,2) to circle (i) is given by

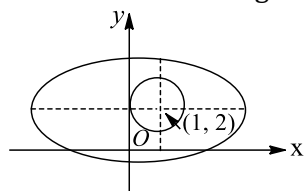
$$r = \sqrt{1 + 4 - 3 - 12 + 14} = 2$$

Hence, the required circle is

$$(x - 1)^2 + (y - 2)^2 = 2^2 \Rightarrow x^2 + y^2 - 2x - 4y + 1 = 0$$

12 **(d)**

It is clear from the figure that the two curves do not intersect each other



13 **(b)**

Directrix of $y^2 = 4(x + 1)$ is $x = -2$. Any point on $x = -2$ is $(-2, k)$

Now mirror image (x, y) of $(-2, k)$ in the line $x + 2y = 3$ is given by

$$\frac{x + 2}{1} = \frac{y - k}{2} = -2 \left(\frac{-2 + 2k - 3}{5} \right)$$

$$\Rightarrow x = \frac{10 - 4k}{5} - 2$$

$$\Rightarrow x = -\frac{4k}{5} \quad \dots(i)$$

$$\text{And } y = \frac{20 - 8k}{5} + k$$

$$\Rightarrow y = \frac{20 - 3k}{5} \quad \dots(ii)$$

From Eqs. (i) and (ii), we get

$$y = 4 + \frac{3}{5} \left(\frac{5x}{4} \right)$$

$$\Rightarrow y = 4 + \frac{3x}{4}$$

$\Rightarrow 4y = 16 + 3x$ is the equation of the mirror image of the directrix

14 **(b)**

Putting $x = at^2$ in $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$,

We get, $t^4 + \frac{y^2}{b^2} = 1$

ie, $y^2 = b^2(1 - t^4) = b^2(1 + t^2)(1 - t^2)$

y is real, if $1 - t^2 \geq 0$

ie, $|t| \leq 1$

16 **(a)**

The combined equation of the lines joining the origin to the points of intersection of $x \cos \alpha + y \sin \alpha = p$ and $x^2 + y^2 - a^2 = 0$ is a homogeneous equation of second degree given by

$$x^2 + y^2 - a^2 \left(\frac{x \cos \alpha + y \sin \alpha}{p} \right)^2 = 0$$

$$\Rightarrow x^2(p^2 - a^2 \cos^2 \alpha) + y^2(p^2 - a^2 \sin^2 \alpha) - (a^2 \sin 2\alpha)xy = 0$$

The lines given by this equation are at right angle

Coeff. of x^2 + Coeff. of y^2 = 0

$$\Rightarrow p^2 - a^2 \cos^2 \alpha + p^2 - a^2 \sin^2 \alpha = 0 \Rightarrow 2p^2 = a^2$$

17 **(a)**

Using $S_1 - S_2 = 0$, we obtain $3x - 9 = 0$ or, $x = 3$ as the equation of the required common tangent

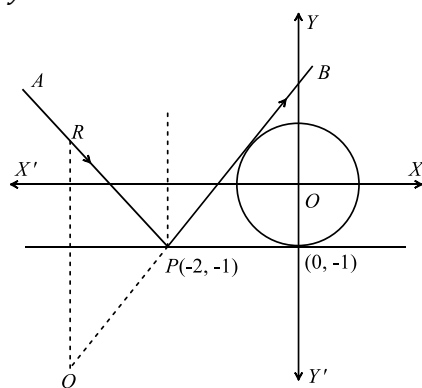
18 **(a)**

Since the difference of the radii of two circles is equal to the distance between their centres.

Therefore, two circles touch each other internally and so only one common tangent can be drawn to given two circles

19 **(b)**

Clearly, the incidence ray passes through the point $P(-2, -1)$ and the image of any point Q on BP is $y = -1$



Let us find the equation of PB . Let its equation be

$$y + 1 = m(x + 2)$$

It touches the circle $x^2 + y^2 = 1$

$$\therefore \left| \frac{2m-1}{\sqrt{m^2+1}} \right| = 1 \Rightarrow m = 0, \frac{4}{3}$$

So, the equation of PB is

$$y+1 = \frac{4}{3}(x+2) \text{ or } 4x-3y+5=0$$

Let $Q(-5,5)$ be a point on PB . The image of Q in $y=-1$ is $R(-5,3)$. So, the equation of RP is

$$y-3 = \frac{3+1}{-5+2}(x+5) \text{ or } 4x+3y+11=0$$

20 **(c)**

The equation of the tangent to the given circle at the origin is $y=x$. Image of the point $A(2,5)$ in $y=x$ is $(5,2)$.

Thus, the coordinates of B are $(5,2)$



ANSWER-KEY										
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A.	C	D	D	B	C	A	C	C	C	D
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	D	B	B	A	A	A	A	B	C



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DPP NO. : 3

Topic :- CONIC SECTION

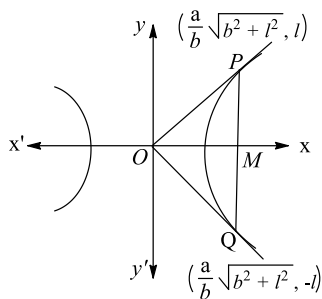
2 (b)

 $\because PQ$ Is the double ordinate. Let $MP = MQ = l$.Given that ΔOPQ is an equilateral, then $OP = OQ = PQ$

$$\Rightarrow (OP)^2 = (OQ)^2 = (PQ)^2$$

$$\Rightarrow \frac{a^2}{b^2}(b^2 + l^2) + l^2 = \frac{a^2}{b^2}(b^2 + l^2) + l^2 = 4l^2$$

$$\Rightarrow \frac{a^2}{b^2}(b^2 + l^2) + 3l^2$$



$$\Rightarrow a^2 = l^2 \left(3 - \frac{a^2}{b^2} \right)$$

$$\Rightarrow l^2 = \frac{a^2 b^2}{(3b^2 - a^2)} > 0$$

$$\therefore 3b^2 - a^2 > 0$$

$$\Rightarrow 3b^2 > a^2$$

$$\Rightarrow 3a^2(e^2 - 1) > a^2$$

$$\Rightarrow e^2 > 4/3$$

$$\therefore e > \frac{2}{\sqrt{3}}$$

3 (b)

Clearly, $x^2 - y^2 = c^2$ and $xy = c^2$ are rectangular hyperbolas each of eccentricity $\sqrt{2}$

$$\therefore e = e_1 = \sqrt{2} \Rightarrow e^2 + e_1^2 = 4$$

4 (b)

Since, both the given hyperbolas are rectangular hyperbolas

$$\therefore e = \sqrt{2}, e_1 = \sqrt{2}$$

$$\text{Hence, } e^2 + e_1^2 = 2 + 2 = 4$$

5 **(d)**

Since, $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, passes through $(3, 0)$ and $(3\sqrt{2}, 2)$

$$\therefore \frac{9}{a^2} = 1$$

$$\Rightarrow a^2 = 9$$

$$\text{and } \frac{9 \times 2}{9} - \frac{4}{b^2} = 1 \Rightarrow b^2 = 4$$

$$\therefore e = \sqrt{1 + \frac{b^2}{a^2}} = \sqrt{1 + \frac{4}{9}} = \frac{\sqrt{13}}{3}$$

6 **(d)**

Let the equation of circles are

$$S_1 \equiv x^2 + y^2 + 2x - 3y + 6 = 0 \quad \dots(i)$$

$$S_2 \equiv x^2 + y^2 + x - 8y - 13 = 0 \quad \dots(ii)$$

$\therefore$ Equation of common chord is

$$S_1 - S_2 = 0$$

$$\Rightarrow (x^2 + y^2 + 2x - 3y + 6) - (x^2 + y^2 + x - 8y - 13) = 0$$

$$\Rightarrow x + 5y + 19 = 0 \quad \dots(iii)$$

In the given option only the point $(1, -4)$ satisfied the Eq. (iii)

7 **(d)**

Let $P(h, k)$ be the given point. Then, the chord of contact of tangents drawn from P to the ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \text{ is}$$

$$\frac{hx}{a^2} + \frac{ky}{b^2} = 1 \quad \dots (i)$$

This subtends a right angle at the centre $C(0,0)$ of the ellipse. The combined equation of the pair of straight lines joining C to the points of intersection of (i) and the ellipse is

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = \left(\frac{hx}{a^2} + \frac{ky}{b^2} \right)^2$$

This equation represents a pair of perpendicular straight lines.

$$\therefore \frac{1}{a^2} - \frac{h^2}{a^4} + \frac{1}{b^2} - \frac{k^2}{b^4} = 0 \Rightarrow \frac{h^2}{a^4} + \frac{k^2}{b^4} = \frac{1}{a^2} + \frac{1}{b^2}$$

$$\text{Hence, the locus of } (h, k) \text{ is } \frac{x^2}{a^4} + \frac{y^2}{b^4} = \frac{1}{a^2} + \frac{1}{b^2}$$

8 **(c)**

The locus is a hyperbola.

9 (a)

Given equation of ellipse can be rewritten as

$$\frac{(x-1)^2}{1/8} + \frac{\left(y + \frac{3}{4}\right)^2}{1/16} = 1$$

$$\therefore \text{Eccentricity} = \sqrt{1 - \frac{b^2}{a^2}} = \sqrt{1 - \frac{8}{16}} = \frac{1}{\sqrt{2}}$$

11 (a)

The equation of the tangent at $(-3, 2)$ to the parabola $y^2 + 4x + 4y = 0$ is

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

$$\Rightarrow 2x + 4y - 2 = 0$$

$$\Rightarrow x + 2y - 1 = 0$$

Since the tangent at one end of the focal chord is parallel to the normal at the other end. Therefore, the slope of the normal at the other end of the focal chord is $-1/2$

12 (c)

Solving the equations of lines in pairs, we obtain that the vertices of the ΔABC are

$$A(0, 6), B(-2\sqrt{3}, 0) \text{ and } C(2\sqrt{3}, 0)$$

Clearly, $AB = BC = CA$

So, ΔABC is an equilateral triangle. Therefore, centroid of the triangle ABC coincides with the circumcentre. Co-ordinates of the circumcentre are $O'(0, 2)$ and the radius $= O'A = 4$.

Hence, the equation of the circumcircle is

$$(x - 0)^2 + (y - 2)^2 = 4^2 \text{ or, } x^2 + y^2 - 4y = 12$$

13 (c)

$$\text{Given, } r^2 - 4r(\cos \theta + \sin \theta) - 4 = 0 \quad \dots(i)$$

$$\text{Put } x = r \cos \theta, \ y = r \sin \theta, \text{ then } r^2 = x^2 + y^2$$

$\therefore$ From Eq. (i)

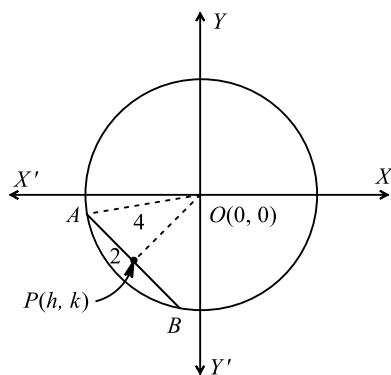
$$x^2 + y^2 - 4(x + y) - 4 = 0$$

$$\Rightarrow x^2 + y^2 - 4x - 4y - 4 = 0$$

$\therefore$ Centre of circle is $(2, 2)$

14 (c)

Let $P(h, k)$ be the mid-point of a chord AB of length 4 units



In ΔOPA , we have

$$OA^2 = OP^2 + AP^2 \Rightarrow 4^2 = h^2 + k^2 + 2^2 \Rightarrow h^2 + k^2 = 12$$

Hence, the locus of $P(h, k)$ is $x^2 + y^2 = 12$, which is a circle of radius $2\sqrt{3}$

15 **(b)**

Equation of normal at $P(a \sec \phi, b \tan \phi)$ is

$$a x \cos \phi + by \cot \phi = a^2 + b^2$$

Then, coordinates of L and M are

$$\left(\frac{a^2+b^2}{a} \cdot \sec \phi, 0\right) \text{ and } \left(0, \frac{a^2+b^2}{b} \tan \phi\right) \text{ respectively.}$$

Let mid point of ML is $Q(h, k)$,

$$\text{Then } h = \frac{(a^2+b^2)}{2a} \sec \phi$$

$$\therefore \sec \phi = \frac{2ah}{(a^2 + b^2)} \dots (i)$$

$$\text{and } k = \frac{(a^2+b^2)}{2b} \tan \phi$$

$$\therefore \tan \phi = \frac{2bk}{(a^2+b^2)} \dots (ii)$$

From Eqs.(i) and (ii), we get

$$\sec^2 \phi - \tan^2 \phi = \frac{4a^2 h^2}{(a^2 + b^2)^2} - \frac{4b^2 k^2}{(a^2 + b^2)^2}$$

Hence, required locus is

$$\frac{x^2}{\left(\frac{a^2 + b^2}{2a}\right)^2} - \frac{y^2}{\left(\frac{a^2 + b^2}{2b}\right)^2} = 1$$

Let eccentricity of this curve is e_1 .

$$\Rightarrow \left(\frac{a^2 + b^2}{2a}\right)^2 = \left(\frac{a^2 + b^2}{2a}\right)^2 (e_1^2 - 1)$$

$$\Rightarrow a^2 = b^2(e_1^2 - 1)$$

$$\Rightarrow a^2 = a^2(e^2 - 1)(e_1^2 - 1) [\because b^2 = a^2(e^2 - 1)]$$

$$\Rightarrow e^2 e_1^2 - e^2 - e_1^2 + 1 = 1$$

$$\Rightarrow e_1^2(e^2 - 1) = e^2$$

$$\Rightarrow e_1 = \frac{e}{\sqrt{e^2 - 1}}$$

16 (b)

Let (h, k) be the mid-point of a chord of the hyperbola $x^2 - y^2 = a^2$. Then, the equation of the chord is

$$hx - ky = h^2 - k^2 \quad [\text{Using : } T = S']$$

$$\Rightarrow y = \frac{h}{k}x + \frac{k^2 - h^2}{k}$$

This touches the parabola $y^2 = 4ax$

$$\therefore \frac{k^2 - h^2}{k} = \frac{a}{h/k} \quad [\text{Using: } c = a/m]$$

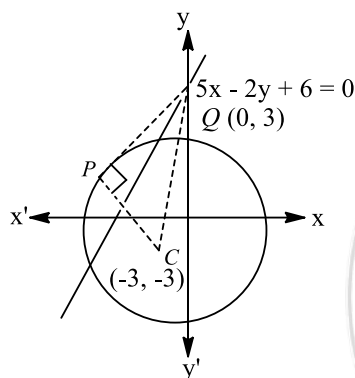
$$\Rightarrow h(k^2 - h^2) = ak^2$$

Hence, the locus of (h, k) is $x(y^2 - x^2) = ay^2$ or, $y^2(x - a) = x^3$

17 (c)

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

Centre $(-3, -3)$, radius $= \sqrt{9 + 9 + 2} = \sqrt{20}$



$$\text{Now, } QC = \sqrt{(-3)^2 + 6^2} = \sqrt{45}$$

In right $\triangle CPQ$

$$PQ = \sqrt{45 - 20} = 5$$

18 (d)

We have, $2a = 6, 2b = 4$

$$\therefore e = \sqrt{1 - \frac{b^2}{a^2}} \Rightarrow e = \sqrt{\frac{5}{3}}$$

So, distance between foci $= 2ae = 6\sqrt{\frac{5}{3}} = 2\sqrt{5}$

and, length of the string $= 2a + 2ae = 6 + 2\sqrt{5}$

19 (b)

The equation of a tangent to the given parabola is

$$y = mx + \frac{9}{4m}$$

If it passes through $(4, 10)$, then



$$10 = 4m + \frac{9}{4m}$$

$$\Rightarrow 16m^2 - 40m + 9 = 0$$

$$\Rightarrow (4m - 1)(4m - 9) = 0 \Rightarrow m = \frac{1}{4}, \frac{9}{4}$$

20 (b)

We know that the area Δ of the triangle formed by the tangent drawn from (x_1, y_1) to the circle $x^2 + y^2 = a^2$ and their chord of contact is given by

$$\Delta = \frac{a(x_1^2 + y_1^2 - a^2)^{3/2}}{x_1^2 + y_1^2}$$

Here, the point is $P(4,3)$ and the circle is $x^2 + y^2 = 9$

$$\therefore \text{Required area} = \frac{3(4^2 + 3^2 - 9)^{3/2}}{4^2 + 3^2} \text{sq. units} = \frac{192}{25} \text{sq. units}$$



ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	D	B	B	B	D	D	D	C	A	D
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	C	C	C	B	B	C	D	B	B



SESSION : 2025-26**DPP**
DAILY PRACTICE PROBLEMSCLASS : XIth

DATE :

Solutions

SUBJECT : MATHS

DPP NO. : 4

Topic :- CONIC SECTION

1 (b)

Given, $y = mx + 2$

and $\frac{x^2}{9} - \frac{y^2}{4} = 1$

Condition of tangency, $c = \pm\sqrt{a^2m^2 - b^2}$

$$2 = \pm\sqrt{9m^2 - 4} \Rightarrow m = \pm\frac{2\sqrt{2}}{3}$$

2 (c)

Let any point $P(x_1, y_1)$ outside the circle. Then, equation of tangent to the circle $x^2 + y^2 + 6x + 6y = 2$ at the point P is

$$xx_1 + yy_1 + 3(x + x_1) + 3(y + y_1) - 2 = 0 \dots(i)$$

The Eq. (i) and the line $5x - 2y + 6 = 0$ intersect at a point Q on y -axis i.e., $x = 0$

$$\Rightarrow 5(0) - 2y + 6 = 0 \Rightarrow y = 3$$

 $\therefore$ Coordinates of Q are $(0, 3)$ Point Q satisfies Eq. (i)

$$\therefore 3x_1 + 6y_1 + 7 = 0 \dots(ii)$$

Distance between P and Q is given by

$$PQ^2 = x_1^2 + (y_1 - 3)^2$$

$$= x_1^2 + y_1^2 - 6y_1 + 9$$

$$= 11 - 6x_1 - 12y_1 \quad (\because x_1^2 + y_1^2 + 6x_1 + 6y_1 - 2 = 0)$$

$$= 11 - 2(3x_1 - 6y_1)$$

$$= 11 - 2(-7) = 25 \quad [\text{from Eq. (ii)}]$$

$$\therefore PQ = 5$$

3 (b)

Equation of circle which touches x -axis and coordinates of centre are (h, k) is

$$(x - h)^2 + (y - k)^2 = k^2$$

Since, it is passing through $(-1, 1)$, then

$$(-1 - h)^2 + (1 - k)^2 = k^2$$

$$\Rightarrow h^2 + 2h - 2k + 2 = 0$$

For real circles, $D \geq 0$,

$$\Rightarrow (2)^2 - 4(-2k + 2) \geq 0 \Rightarrow k \geq \frac{1}{2}$$

4 **(b)**

The required equation of circle is

$$(x^2 + y^2 - 6) + \lambda(x^2 + y^2 - 6y + 8) = 0 \dots(i)$$

It passes through (1, 1)

$$\therefore (1 + 1 - 6) + \lambda(1 + 1 - 6 + 8) = 0$$

$$\Rightarrow -4 + 4\lambda = 0$$

$$\Rightarrow \lambda = 1$$

$\therefore$ required equation of circle is

$$x^2 + y^2 - 6 + x^2 + y^2 - 6y + 8 = 0$$

$$\Rightarrow 2x^2 + 2y^2 - 6y + 2 = 0$$

$$\Rightarrow x^2 + y^2 - 3y + 1 = 0$$

5 **(a)**

The equation of a normal to $y^2 = 4x$ is $y = mx - 2m - m^3$.

If it passes through $(11/4, 1/4)$, then

$$\frac{1}{4} = \frac{11m}{4} - 2m - m^3$$

$$\Rightarrow 1 = 11m - 8m - 4m^3$$

$$\Rightarrow 4m^3 - 3m + 1 = 0 \Rightarrow m = \frac{1}{2}, \frac{-1 \pm \sqrt{3}}{2}$$

Hence, three normals can be drawn from $(11/4, 1/4)$ to $y^2 = 4x$

6 **(d)**

Here, $a^2 = \cos^2 \alpha$ and $b^2 = \sin^2 \alpha$

$$\text{Now, } e = \sqrt{1 + \frac{b^2}{a^2}} \Rightarrow e = \sqrt{1 + \frac{\sin^2 \alpha}{\cos^2 \alpha}}$$

$$\Rightarrow e = \sqrt{1 + \tan^2 \alpha} \Rightarrow e = \sec \alpha$$

Coordinates of foci are $(\pm ae, 0)$ i.e., $(\pm 1, 0)$

Hence, abscissae of foci remain constant when α varies.

8 **(c)**

It is a known result

$$t_1 t_2 = -1$$

9 **(a)**

Here, $g_1 = -1, f_1 = 11, c_1 = 5$

and $g_2 = 7, f_2 = 3, c_2 = k$

$$\Rightarrow 2(-1.7 + 11.3) = 5 + k \Rightarrow k = 47$$

10 (c)

If the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the straight line $y = mx + c$ intersect in real points, then the quadratic equation $\frac{x^2}{a^2} + \frac{(mx+c)^2}{b^2} = 1$ must have real roots.

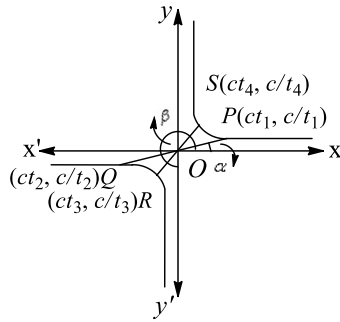
$$\therefore \text{Discriminant} \geq 0 \Rightarrow c^2 \leq a^2 m^2 + b^2$$

11 (a)

Let the equation of rectangular hyperbola is $xy = c^2$.

Take any four points on the hyperbola

$P\left(ct_1, \frac{c}{t_1}\right), Q\left(ct_2, \frac{c}{t_2}\right), R\left(ct_3, \frac{c}{t_3}\right)$ and $S\left(ct_4, \frac{c}{t_4}\right)$ Such that PQ is perpendicular to RS .



Since, OP makes angle α with OX .

$$\text{Therefore, } \tan \alpha = \frac{\frac{c}{t_1}}{ct_1} = \frac{1}{t_1^2}$$

$$\text{Similarly, } \tan \beta = \frac{1}{t_2^2}, \tan \gamma = \frac{1}{t_3^2} \text{ and } \tan \delta = \frac{1}{t_4^2}$$

$$\therefore \tan \alpha \tan \beta \tan \gamma \tan \delta = \frac{1}{t_1^2 t_2^2 t_3^2 t_4^2} \dots (i)$$

Now, PQ is perpendicular to RS .

$$\therefore \frac{\frac{c}{t_2} - \frac{c}{t_1}}{ct_2 - ct_1} \times \frac{\frac{c}{t_4} - \frac{c}{t_3}}{ct_4 - ct_3} = -1$$

$$\Rightarrow -\frac{1}{t_1 t_2} \times \left(-\frac{1}{t_3 t_4}\right) = -1$$

$$\Rightarrow \frac{1}{t_1 t_2 t_3 t_4} = -1$$

$$\Rightarrow t_1 t_2 t_3 t_4 = -1$$

From Eq.(i),

$$\tan \alpha \tan \beta \tan \gamma \tan \delta = 1$$

12 (a)

$$\text{Equation of hyperbola is } \frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

Distance between foci of hyperbola = $2ae$

$$\text{and its distance between directrices} = \frac{2a}{e}$$

According to the question,

$$\frac{2ae}{2a/e} = \frac{3}{2}$$

$$\Rightarrow e^2 = \frac{3}{2}$$

$$\text{Using, } b^2 = a^2(e^2 - 1) \Rightarrow \frac{b^2}{a^2} = \frac{3}{2} - 1$$

$$\Rightarrow \frac{a}{b} = \frac{\sqrt{2}}{1}$$

13 **(b)**

Equation of pair of tangents is

$$SS_1 = T^2$$

$$\Rightarrow (x^2 + y^2 - 4)(9 + 4 - 4) = (3x + 2y - 4)^2$$

$$\Rightarrow 5y^2 + 16y - 12xy + 24x - 50 = 0$$

$$\therefore m_1 + m_2 = -\frac{2h}{b} = \frac{12}{5}$$

$$\text{and } m_1 m_2 = 0$$

$$\text{Now, } m_1 - m_2 = \sqrt{(m_1 + m_2)^2 - 4m_1 m_2}$$

$$= \sqrt{\left(\frac{12}{5}\right)^2 - 0} = \frac{12}{5}$$

14 **(c)**

$$\text{Given equation is } 9x^2 + 4y^2 - 6x + 4y + 1 = 0$$

$$\Rightarrow 9\left(x^2 - \frac{2}{3}x + \frac{1}{9}\right) + 4\left(y^2 + y + \frac{1}{4}\right) + 1 - 1 - 1 = 0$$

$$\Rightarrow \frac{\left(x - \frac{1}{3}\right)^2}{\left(\frac{1}{3}\right)^2} + \frac{\left(y + \frac{1}{2}\right)^2}{\left(\frac{1}{2}\right)^2} = 1 \text{ (here, } a < b)$$

$$\text{Length of major axis} = 2b = 2\left(\frac{1}{2}\right) = 1$$

$$\text{Length of minor axis} = 2a = 2\left(\frac{1}{3}\right) = \frac{2}{3}$$

15 **(a)**

Equation of two straight lines are

$$\sqrt{3}x - y = 4\sqrt{3}\alpha$$

and $\sqrt{3}x + y = \frac{4\sqrt{3}}{\alpha}$

Solving above equations, we get

$$3x^2 - y^2 = 48 \Rightarrow \frac{x^2}{16} - \frac{y^2}{48} = 1$$

Which is a hyperbola

Whose eccentricity

$$e = \sqrt{\frac{48 + 16}{16}} = \sqrt{4} = 2$$

16 (c)

Given equation of circle can be rewritten as

$$x^2 + y^2 - 2x + 4y + \frac{k}{4} = 0$$

$$\therefore \text{Radius of circle} = \sqrt{1 + 4 - \frac{k}{4}} = \sqrt{5 - \frac{k}{4}}$$

Area of circle = 9π (given)

$$\Rightarrow \pi \left(5 - \frac{k}{4}\right) = 9\pi$$

$$\Rightarrow 5 - 9 = \frac{k}{4} \Rightarrow k = -16$$

17 (c)

The circle passes through $(0,0)$, $(a,0)$, $(0,a)$ and (a,a)

Hence, the required equation is $x^2 + y^2 - ax - ay = 0$

18 (c)

It is given that the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ bisects the circumference of the circle $x^2 + y^2 + 2g'x + 2f'y + c' = 0$. Therefore, the common chord of these two circles passes through the centre $(-g', -f')$ of $x^2 + y^2 + 2g'x + 2f'y + c' = 0$

The equation of the common chord of the two given circles is

$$2x(g - g') + 2y(f - f') + c - c' = 0$$

This passes through $(-g', -f')$

$$\therefore -2g'(g - g') - 2f'(f - f') + c - c' = 0$$

$$\Rightarrow 2g'(g - g') + 2f'(f - f') = c - c'$$

19 (a)

The slope of the tangent to $y^2 = 4x$ at $(16,8)$ is given by

$$m_1 = \left(\frac{dy}{dx}\right)_{(16,8)} = \left(\frac{4}{2y}\right)_{(16,8)} = \frac{2}{8} = \frac{1}{4}$$

The slope of the tangent to $x^2 = 32y$ at $(16,8)$ is given by

$$m_2 = \left(\frac{dy}{dx} \right)_{(16,8)} = \left(\frac{2x}{32} \right)_{(16,8)} = 1$$

$$\therefore \tan \theta = \frac{1 - \frac{1}{4}}{1 + \frac{1}{4}} = \frac{3}{5} \Rightarrow \theta = \tan^{-1} \left(\frac{3}{5} \right)$$

20 **(a)**

Let the equation of circle be

$$x^2 + y^2 + 2gx + 2fy + c = 0 \quad \dots(i)$$

Given equation of circles are

$$x^2 + y^2 - 2x + 3y - 7 = 0 \quad \dots(ii)$$

$$x^2 + y^2 + 5x - 5y + 9 = 0 \quad \dots(iii)$$

$$\text{and } x^2 + y^2 + 7x - 9y + 29 = 0 \quad \dots(iv)$$

Since, the circle (i) cut all three circles orthogonally,

$$\therefore 2g(-1) + 2f(3/2) = c - 7 \Rightarrow -2g + 3f - c = -7 \quad \dots(v)$$

$$2g(5/2) + 2f(-5/2) = c + 29 \Rightarrow 5g - 5f - c = 9 \quad \dots(vi)$$

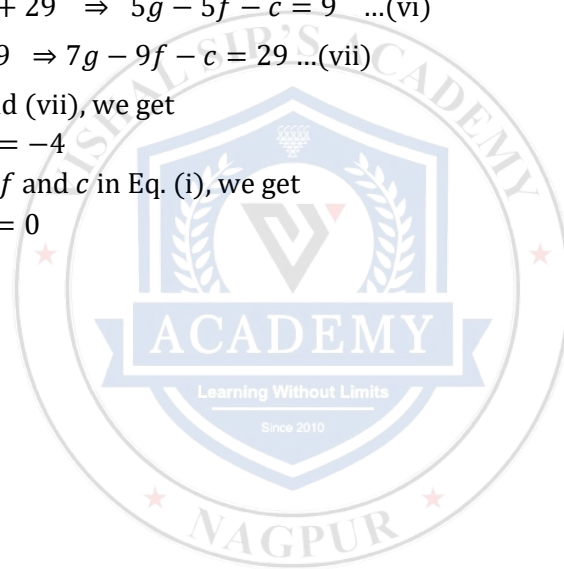
$$2g\left(\frac{7}{2}\right) + 2f\left(-\frac{9}{2}\right) = c + 29 \Rightarrow 7g - 9f - c = 29 \quad \dots(vii)$$

On solving Eqs. (v), (vi) and (vii), we get

$$g = -8, \quad f = -9 \quad \text{and} \quad c = -4$$

On putting the values of g, f and c in Eq. (i), we get

$$x^2 + y^2 - 16x - 18y - 4 = 0$$



ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	C	B	B	A	D	D	C	A	C
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	A	B	C	A	C	C	C	A	A



Topic :- CONIC SECTION**1 (a)**Using $SS' = T^2$, the combined equation of the tangents drawn from (0,0) to $y^2 = 4a(x - a)$ is

$$(y^2 - 4ax + 4a^2)(0 - 0 + 4a^2) = [y \cdot 0 - 2a(x + 0 - 2a)]^2$$

$$\Rightarrow (y^2 - 4ax + 4a^2)(4a^2) = 4a^2(x - 2a)^2$$

$$\Rightarrow y^2 - 4ax + 4a^2 = (x - 2a)^2$$

$$\Rightarrow x^2 - y^2 = 0$$

Clearly, Coeff. of x^2 + Coeff. of y^2 = 0. Therefore, the required angle is a right angleALITER The point (0,0) lies on the directrix $x = 0$ of the parabola $y^2 = 4a(x - a)$, therefore the tangents are at right angle**2 (c)**We know that length of latusrectum of an ellipse = $\frac{2b^2}{a}$ and length of its minor axis = $2b$

$$\text{Then, } \frac{2b^2}{a} = b \Rightarrow 2b = a$$

$$\therefore e = \sqrt{1 - \frac{b^2}{a^2}} = \sqrt{1 - \frac{b^2}{4b^2}} = \frac{\sqrt{3}}{2}$$

3 (b)

The required point is the radical centre of the given circles

4 (a)Equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a parabola, if $h^2 = ab$ **5 (d)**Let e and e' be the eccentricities of the ellipse and hyperbola

$$\therefore e = \sqrt{\frac{a^2 - b^2}{a^2}} = \sqrt{\frac{25 - 16}{25}} = \frac{3}{5}$$

$$\text{and } e' = \sqrt{\frac{a^2 + b^2}{a^2}} = \sqrt{\frac{25 + 16}{25}} = \frac{\sqrt{41}}{5}$$

1. Centre of ellipse is (0, 0) and centre of hyperbola is (0, 0)

2. Foci of ellipse are $(\pm ae, 0)$ or $(\pm 3, 0)$ foci of hyperbola are $(\pm ae', 0)$ or $(\pm \sqrt{41}, 0)$

3. Directrices of ellipse are $x = \pm \frac{a}{e} \Rightarrow x = \pm \frac{25}{3}$

Directrices of hyperbola are $x = \pm \frac{a}{e}$

$$\Rightarrow x = \pm \frac{25}{\sqrt{41}}$$

4. Vertices of ellipse are $(\pm a, 0)$ or $(\pm 5, 0)$

Vertices of hyperbola are $(\pm a, 0)$ or $(\pm 5, 0)$

From the above discussions, they are common in centre and vertices.

6 (c)

Given equation is $\frac{x^2}{16} - \frac{y^2}{25} = 1$

$$\therefore e = \sqrt{1 + \frac{b^2}{a^2}} = \sqrt{1 + \frac{25}{16}} = \frac{\sqrt{41}}{4}$$

7 (d)

Equation of tangent to $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is

$$y = mx + \sqrt{a^2 m^2 + b^2}$$

And equation of tangent to $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 2$ is

$$y = mx + \sqrt{2a^2 m^2 + 2b^2}$$

For common tangent,

$$a^2 m^2 + b^2 = 2a^2 m^2 - 2b^2$$

$$\Rightarrow a^2 m^2 = 3b^2 \Rightarrow m = \pm \frac{\sqrt{3}b}{a}$$

$\therefore$ Equation of common tangent is $y = \frac{\sqrt{3}b}{a}x + 2b$.

8 (a)

The equation of a tangent to $xy = c^2$ is

$$\frac{x}{t} + yt = 2c \quad (i)$$

If $lx + my + n = 0$ is a tangent to $xy = c^2$, then it should be of the form of equation (i).

$$\therefore \frac{l}{1/t} = \frac{m}{t} = \frac{-n}{2c}$$

$$\Rightarrow lt = \frac{m}{t} = -\frac{n}{2c}$$

$$\Rightarrow lt = -\frac{n}{2c} \text{ and } \frac{m}{t} = -\frac{n}{2c}$$

$$\Rightarrow lm = \frac{n^2}{4c^2}$$

$\Rightarrow lm > 0 \Rightarrow l$ and m are of the same sign

10 (c)

The equation of the tangent at $(4, -2)$ to $y^2 = x$ is

$$-2y = \frac{1}{2}(x + 4) \Rightarrow x + 4y + 4 = 0$$

Its slope is $-1/4$. Therefore, the slope of the perpendicular line is 4. Since the tangents at the end points of a focal chord of a parabola are at right angles. Therefore, the slope of the tangent at Q is 4

11 (a)

The equation of a normal to $y^2 = 4x$ is

$$y + tx = 2t + t^3 \quad \dots(i)$$

If it passes through $(3,0)$, then

$$3t = 2t + t^3 \Rightarrow t = 0, \pm 1$$

Putting the values of t in (i), we get

$$y = 0, y + x = 3 \text{ and } y - x = -3$$

As the equation of the normals

12 (a)

Let $\frac{x}{a} \cos \theta + \frac{y}{b} \sin \theta = 1$ be tangent at

$P(a \cos \theta, b \sin \theta)$.

It cuts the coordinates axes at $P(a \sec \theta, 0)$ and $Q(0, b \operatorname{cosec} \theta)$

$$\therefore CP = a \sec \theta \text{ and } CQ = b \operatorname{cosec} \theta$$

$$\Rightarrow \frac{a^2}{CP^2} + \frac{b^2}{CQ^2} = 1$$

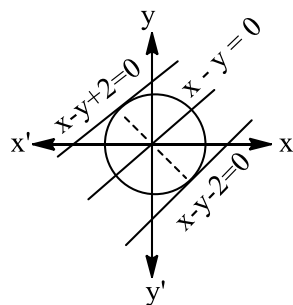
13 (c)

Since, the equation of tangents $x - y - 2 = 0$ and $x - y + 2 = 0$ are parallel.

$$\therefore \text{Distance between them} = \text{Diameter of the circle} = \frac{2 - (-2)}{\sqrt{1^2 + 1^2}}$$

$$\left(\because \frac{c_2 - c_1}{\sqrt{a^2 + b^2}} \right)$$

$$= \frac{4}{\sqrt{2}} = 2\sqrt{2}$$



$$\therefore \text{Radius} = \frac{1}{2}(2\sqrt{2}) = \sqrt{2}$$

It is clear from the figure that centre lies on the origin.

$\therefore$ Equation of circle is

$$(x - 0)^2 + (y - 0)^2 = (\sqrt{2})^2$$

$$\Rightarrow x^2 + y^2 = 2$$

14 (b)

Equation of family of concentric circles to the circle $x^2 + y^2 + 6x + 8y - 5 = 0$ is $x^2 + y^2 + 6x + 8y + \lambda = 0$ which is similar to $x^2 + y^2 + 2gx + 2fy + c = 0$. Since, it is equation of concentric circle to the circle $x^2 + y^2 + 6x + 8y - 5 = 0$. Thus, the point $(-3, 2)$ lies on the circle $x^2 + y^2 + 6x + 8y + c = 0$

$$\Rightarrow (-3)^2 + (2)^2 + 6(-3) + 8(2) + c = 0$$

$$\Rightarrow 9 + 4 - 18 + 16 + c = 0$$

$$\Rightarrow c = -11$$

15 (d)

On solving the given equations, we get $(0, 0), B(0, 5/3), C(5/2, 0)$.

Let equation of circle be

$$x^2 + y^2 + 2gx + 2fy + c = 0 \quad \dots(i)$$

Eq. (i) passes through $A(0, 0)$, we get $c = 0$

Similarly, Eq. (i) passes through $B(0, 5/3)$ and $C(5/2, 0)$, we get

$$2f = -5/3 \quad \text{and} \quad 2g = -5/2$$

$\therefore$ Required equation of circle is

$$x^2 + y^2 - \frac{5}{2}x - \frac{5}{3}y = 0$$

$$\Rightarrow 6x^2 + 6y^2 - 15x - 10y = 0$$

16 (c)

We have,

$$OM = OA + AM = 2 + 5/2 = 9/2$$

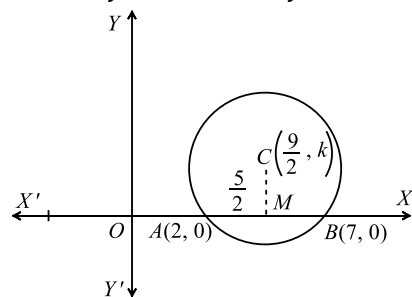
So, the x-coordinate of the centre is $9/2$

$$\therefore \text{Radius} = CA = \sqrt{(9/2 - 2)^2 + (k - 0)^2}$$

Hence, the equation of the circle is

$$(x - 9/2)^2 + (y - k)^2 = \sqrt{(9/2 - 2)^2 + k^2}$$

$$\Rightarrow x^2 + y^2 - 9x - 2ky + 14 = 0$$



18 (b)

Let $P(x_1, y_1)$ be a point on $x^2 + y^2 = a^2$. Then,

$$x_1^2 + y_1^2 = a^2 \quad \dots(i)$$

Let QR be the chord of contact of tangents drawn from $P(x_1, y_1)$ to the circle $x^2 + y^2 = b^2$. Then, the equation QR is

$$xx_1 + yy_1 = b^2 \quad \dots(ii)$$

This touches the circle $x^2 + y^2 = c^2$

$$\therefore \left| \frac{0x_1 + 0y_1 - b^2}{\sqrt{x_1^2 + y_1^2}} \right| = c \Rightarrow b^2 = ac \quad [\text{Usin : (i)}]$$

Let D be the discriminant of $ax^2 + 2bx + c = 0$. Then,

$$D = 4(b^2 - ac) = 0 \quad [\because b^2 = ac]$$

Hence, the roots of the given equal are real and equal

19 **(c)**

The equation of the line joining (3,3) and (-3,3) i.e. axis of the parabola is $y - 3 = 0$.

Since the directrix is a line perpendicular to the axis. Therefore, its equation is $x + \lambda = 0$.

The directrix intersects with the axis at $(-\lambda, 3)$ and the vertex is the mid point of the line segment joining the focus and the point of intersection of the directrix and axis

$$\therefore \frac{-\lambda - 3}{2} = 3 \Rightarrow \lambda = -9$$

So, the equation of the directrix is $x - 9 = 0$

Let $P(x, y)$ be any point on the parabola. Then, by definition, we have

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

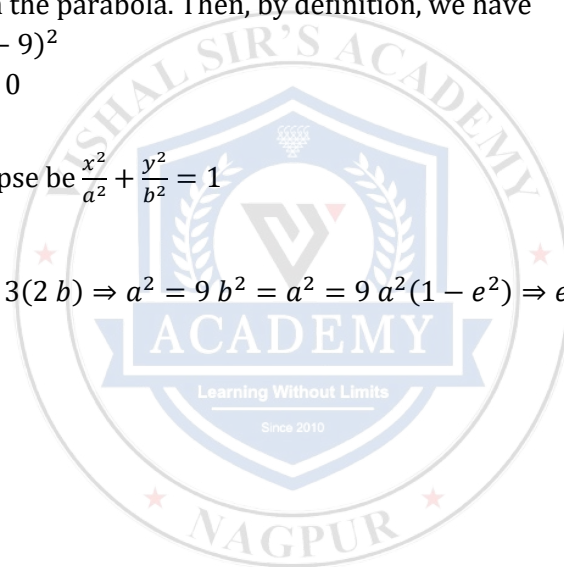
$$\Rightarrow y^2 - 6y + 24x - 63 = 0$$

20 **(d)**

Let the equation of the ellipse be $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

It is given that,

$$2a = 3(2b) \Rightarrow a^2 = 9b^2 = a^2 = 9a^2(1 - e^2) \Rightarrow e = \frac{2\sqrt{2}}{3}$$



ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	A	C	B	A	D	C	D	A	B	C
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	A	C	B	D	C	A	B	C	D



SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

CLASS : XIth
DATE :

Solutions

SUBJECT : MATHS
DPP NO. : 6

Topic :- CONIC SECTION

1 (c)

We have,

$$x^2 + y^2 + ax + (1-a)y + 5 = 0$$

It is given that the radius of this circle is less than or equal to 5

$$\therefore \frac{a^2}{4} + \frac{(1-a)^2}{4} - 5 \leq 25$$

$$\Rightarrow 2a^2 - 2a - 119 \leq 0 \Rightarrow -7.2 \leq a \leq 8.2 \Rightarrow a \in [-7, 8]$$

But, a is an integer

$$\therefore a = -7, -6, -5, -4, -3, -2, -1, 1, 0, 1, 2, 3, 4, 5, 6, 7, 8$$

Hence, these are 16 integral values of a

2 (d)

Given equation of circles are $x^2 + y^2 - 2x - 4y + 1 = 0$ and $x^2 + y^2 - 12x - 16y + 91 = 0$ whose centre and radius are $C_1(1, 2), r_1 = 2$ and $C_2(6, 8), r_2 = 3$

$$\therefore C_1C_2 = \sqrt{(1-6)^2 + (2-8)^2} \\ = \sqrt{25 + 36} = \sqrt{61}$$

$$\text{And } r_1 + r_2 = 2 + 3 = 5$$

$$\therefore C_1C_2 > r_1 + r_2$$

$$\therefore \text{Number of common tangents} = 4$$

3 (c)

We know that the locus of point P from which two perpendicular tangents are drawn to the parabola, is the directrix of the parabola.

Hence, the required locus is $x = 1$

4 (b)

Let two coplanar points be $(0, 0)$ and $(a, 0)$

$$\therefore \frac{\sqrt{x^2 + y^2}}{\sqrt{(x-a)^2 + y^2}} = \lambda \quad [\lambda \neq 1]$$

[where λ is any number]

$$\Rightarrow x^2 + y^2 + \left(\frac{\lambda^2}{\lambda^2 - 1}\right)(a^2 - 2ax) = 0$$

Which is the equation of circle

5 (c)

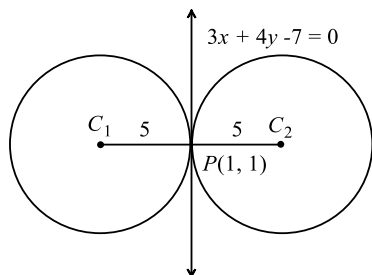
The equation of line C_1C_2 is

$$\frac{x-1}{3/5} = \frac{y-1}{4/5}$$

So, the coordinates of C_1 and C_2 are given by

$$\frac{x-1}{3/5} = \frac{y-1}{4/5} = \pm 5 \Rightarrow x = 1 \pm 3, y = 1 \pm 4$$

Thus, the coordinates of the centres are $(4,5), (-2,-3)$



6 (d)

The tangent at $(1, 7)$ to the parabola $x^2 = y - 6$ is

$$x = \frac{1}{2}(y + 7) - 6$$

$$\Rightarrow 2x = y + 7 - 12$$

$$\Rightarrow y = 2x + 5$$

Which is also tangent to the circle

$$x^2 + y^2 + 16x + 12y + c = 0$$

$$\therefore x^2 + (2x + 5)^2 + 16x + 12(2x + 5) + c = 0$$

$$\text{Or } 5x^2 + 60x + 85 + c = 0$$

Must have equal roots

Let α and β are the roots of the equation

$$\Rightarrow \alpha + \beta = -12 \Rightarrow \alpha = -6 \quad (\because \alpha = \beta)$$

$$\therefore x = -6 \text{ and } y = 2x + 5 = -7$$

$\Rightarrow$ point of contact is $(-6, -7)$

7 (c)

Let $C(0,0)$ be the centre and $L(ae, b^2/a)$ and $L'(-ae, b^2/a)$ be the vertices of latusrectum LL' . Then,

$$m_1 = \text{Slope of } CL = \frac{b^2/a - 0}{ae - 0} = \frac{b^2}{a^2e}$$

$$m_2 = \text{Slope of } CL' = \frac{b^2/a - 0}{-ae - 0} = \frac{-b^2}{a^2e}$$

It is given that $\angle LCL' = \pi/2$

$$\therefore m_1 m_2 = -1$$

$$\Rightarrow \frac{b^2}{a^2e} \times \frac{-b^2}{a^2e} = -1$$

$$\Rightarrow (e^2 - 1)^2 = e^2$$

$$\Rightarrow e^2 - 1 = e \Rightarrow e^2 - e - 1 = 0 \Rightarrow e = \frac{1 + \sqrt{5}}{2}$$

8 (c)

Given, ellipse $\frac{x^2}{16} + \frac{y^2}{7} = 1$

$$\therefore e_1 = \sqrt{1 - \frac{7}{16}} = \frac{3}{4}$$

and hyperbola $\frac{x^2}{9} - \frac{y^2}{7} = 1$

$$\therefore e_2 = \sqrt{1 + \frac{7}{9}} = \frac{4}{3}$$

$$\text{Now, } e_1 + e_2 = \frac{3}{4} + \frac{4}{3} = \frac{25}{12}$$

9 (c)

The equation of normal to the given ellipse at $P(a \cos \theta, b \sin \theta)$ is

$$ax \sec \theta - by \operatorname{cosec} \theta - a^2 = b^2$$

$$\Rightarrow y = \left(\frac{a}{b} \tan \theta\right)x - \frac{a^2 - b^2}{b} \sin \theta \dots (i)$$

$$\text{Let } \frac{a}{b} \tan \theta = m, \text{ then } \sin \theta = \frac{bm}{\sqrt{a^2 + b^2 m^2}}$$

$\therefore$ From Eq. (i), we get

$$y = mx - \frac{(a^2 - b^2)m}{\sqrt{a^2 + b^2 m^2}}$$

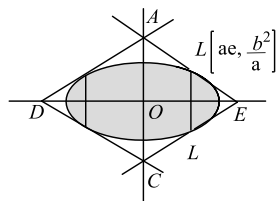
$$\therefore \frac{a}{b} \tan \theta \in R \Rightarrow m \in R$$

10 (d)

$$\text{Given, } \frac{x^2}{9} + \frac{y^2}{5} = 1$$

Latusrectum of an ellipse be

$$ae = \sqrt{a^2 - b^2} = \sqrt{4} = 2$$



By symmetry the quadrilateral is rhombus

$$\Rightarrow \text{Equation of tangent at } \left(ae, \frac{b^2}{a}\right) = \left(2, \frac{5}{3}\right)$$

$$\text{ie, } \frac{2}{9}x + \frac{5}{3} \cdot \frac{y}{5} = 1$$

$$\Rightarrow \frac{x}{9/2} + \frac{y}{3} = 1$$

$\therefore$ Area of quadrilateral $ABCD = 4(\text{area of } \Delta AOB)$

$$= 4 \cdot \left\{ \frac{1}{2} \cdot \frac{9}{2} \cdot 3 \right\}$$

$$= 27 \text{ sq units}$$

11 (c)

The equation of the tangent at $P(a \sec \theta, b \tan \theta)$ to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is

$$\frac{x}{a} \sec \theta - \frac{y}{b} \tan \theta = 1$$

This cuts the line $\frac{x}{a} - \frac{y}{b} = 0$ and $\frac{x}{a} + \frac{y}{b} = 0$ at Q and R

The coordinates of Q and R are

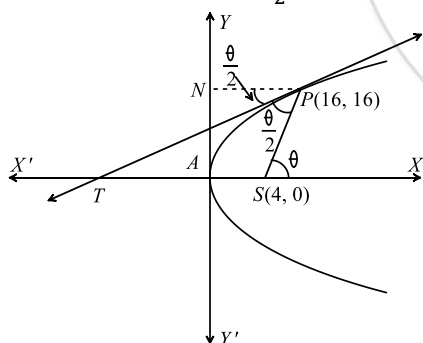
$$Q \left(\frac{a}{\sec \theta - \tan \theta}, \frac{b}{\sec \theta - \tan \theta} \right), R \left(\frac{a}{\sec \theta + \tan \theta}, \frac{-b}{\sec \theta + \tan \theta} \right)$$

$$\therefore CQ \cdot CR = \frac{\sqrt{a^2 + b^2}}{(\sec \theta - \tan \theta)} \times \frac{\sqrt{a^2 + b^2}}{(\sec \theta + \tan \theta)} = a^2 + b^2$$

12 (c)

We know that PT bisects $\angle NPS$

Let $\angle NPT = \angle TPS = \frac{\theta}{2}$. Then,



$$\angle PSX = \theta$$

$$\Rightarrow \tan \theta = \frac{16 - 0}{16 - 4}$$

$$\Rightarrow \tan \theta = \frac{4}{3}$$

$$\Rightarrow \frac{2 \tan \theta/2}{1 - \tan^2 \theta/2} = \frac{4}{3}$$

$$\Rightarrow 3 \tan \frac{\theta}{2} = 2 - 2 \tan^2 \frac{\theta}{2}$$

$$\Rightarrow 2 \tan^2 \frac{\theta}{2} + 3 \tan \frac{\theta}{2} - 2 = 0$$

$$\Rightarrow \left(2 \tan \frac{\theta}{2} - 1\right) \left(\tan \frac{\theta}{2} + 2\right) = 0$$

$$\Rightarrow \tan \frac{\theta}{2} = \frac{1}{2} \quad \left[\because \frac{\theta}{2} \text{ is acute} \right]$$

$$\Rightarrow \frac{\theta}{2} = \tan^{-1} \left(\frac{1}{2} \right) \Rightarrow \angle TPS = \tan^{-1} \left(\frac{1}{2} \right)$$

13 (d)

The centres and radii of given circles are $C_1(0, 0)$, $C_2(4, 0)$ and $r_1 = 2$, $r_2 = 2$

$$\text{Now, } C_1C_2 = \sqrt{(4-0)^2 + 0} = 4$$

$$\text{and } r_1 + r_2 = 2 + 2 = 4$$

$$\therefore C_1C_2 = r_1 + r_2$$

Hence, three common tangents are possible

14 (b)

Given, circle cuts the parabola

$$\therefore x^2 + \left(\frac{x^2}{4a}\right)^2 + 2gx + 2f\left(\frac{x^2}{4a}\right) + c = 0$$

$$\Rightarrow x^4 + 16a^2x^2 + 8afx^2 + 32gxa^2 + 16a^2c = 0$$

$$\sum x_i = 0 \quad \dots(i)$$

$$\sum x_1x_2 = 16a^2 + 8af \quad \dots(ii)$$

$$\text{Now, } \sum y_i = \frac{1}{4a} \sum x_i^2$$

$$= \frac{1}{4a} [(x_1 + x_2 + x_3 + x_4)^2 - 2 \sum x_1x_2]$$

$$= -\frac{1}{2a} (16a^2 + 8af) = -4(f + 2a)$$

15 (b)

Let the coordinates of A and B be $(a, 0)$ and $(0, b)$ respectively. then,

$$a^2 + b^2 = 9^2 \quad \dots(i)$$

Let $P(h, k)$ be the centroid of ΔOAB . Then,

$$h = \frac{a}{3} \text{ and } k = \frac{b}{3} \Rightarrow a = 3h \text{ and } b = 3k$$

Substituting the values of a and b in (i), we get

$$9h^2 + 9k^2 = 9^2 \Rightarrow h^2 + k^2 = 9$$

Hence, the locus of (h, k) is $x^2 + y^2 = 9$

16 (a)

Given focal chord of parabola $y^2 = ax$ is $2x - y - 8 = 0$

Since, this chord passes through focus $\left(\frac{a}{4}, 0\right)$

$$\therefore 2 \cdot \frac{a}{4} - 0 - 8 = 0 \Rightarrow a = 16$$

Hence, directrix is $x = -4 \Rightarrow x + 4 = 0$

17 **(b)**

Let one of the points be $P(r \cos \theta, r \sin \theta)$. Then, the other point is $Q(r \cos(\pi/2 + \theta), (r \sin(\pi/2 + \theta)))$ i.e. $Q(-r \sin \theta, r \cos \theta)$. The equations of tangents at P and Q are

$$x \cos \theta + y \sin \theta = r \text{ and } -x \sin \theta + y \cos \theta = r$$

The locus of the point of intersection of these two is obtained by eliminating θ from these two equations. Squaring and adding the two equations, we get

$$(x \cos \theta + y \sin \theta)^2 + (-x \sin \theta + y \cos \theta)^2 = r^2 + r^2$$

or, $x^2 + y^2 = 2r^2$, which is the required locus

18 **(a)**

The coordinates of a point dividing PQ internally in the ratio $1 : \lambda$ are

$$\left(\frac{1 + \lambda}{\lambda + 1}, \frac{1 + 3\lambda}{\lambda + 1} \right)$$

This point is an interior point of the parabola $y^2 = 4x$

$$\therefore \left(\frac{1 + 3\lambda}{\lambda + 1} \right)^2 - 4 \left(\frac{1 + \lambda}{\lambda + 1} \right) < 0$$

$$\Rightarrow (3\lambda + 1)^2 - 4(\lambda + 1)^2 < 0$$

$$\Rightarrow 5\lambda^2 - 2\lambda - 3 < 0$$

$$\Rightarrow (5\lambda + 3)(\lambda - 1) < 0$$

$$\Rightarrow \lambda - 1 < 0 \quad [\because \lambda > 0]$$

$$\Rightarrow 0 < \lambda < 1 \Rightarrow \lambda \in (0, 1)$$

19 **(b)**

Given that, $y = 2x + c$... (i)

And $x^2 + y^2 = 16$... (ii)

We know that, if $y = mx + c$ is tangent to the circle

$$x^2 + y^2 = a^2, \text{ then } c = \pm a\sqrt{1 + m^2}, \text{ here, } m = 2, a = 4$$

$$\therefore c = \pm 4\sqrt{1 + 2^2} = \pm 4\sqrt{5}$$

20 **(a)**

Given, $x^2 + y^2 = 6x$... (i)

and $x^2 + y^2 + 6x + 2y + 1 = 0$... (ii)

From Eq. (i), $x^2 - 6x + y^2 = 0$

$$\Rightarrow (x - 3)^2 + y^2 = 3^2$$

$\therefore$ Centre $(3, 0), r = 3$

From Eq. (ii),

$$x^2 + 6x + y^2 + 2y + 1 + 3^2 = 3^2$$

$$\Rightarrow (x + 3)^2 + (y + 1)^2 = 3^2$$

$\therefore$ Centre $(-3, -1)$, radius = 3

Now, distance between centres

$$= \sqrt{(3 + 3)^2 + 1}$$

$$= \sqrt{37} > r_1 + r_2 = 6$$

$\therefore$ Circles do not cut each other

⇒ 4 tangents (two direct and two transversal) are possible

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	C	D	C	B	C	D	C	C	C	D
Q.	11	12	13	14	15	16	17	18	19	20
A.	C	C	D	B	B	A	B	A	B	A



SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

CLASS : XIth
DATE :

Solutions

SUBJECT : MATHS
DPP NO. : 7

Topic :- CONIC SECTION

1 (d)

Centre of the given circle is $(4, -2)$. Therefore, the equation of the unit circle concentric with the given circle is $(x - 4)^2 + (y + 2)^2 = 1 \Rightarrow x^2 + y^2 - 8x + 4y + 19 = 0$

2 (a)

Since, the point $(9a, 6a)$ is bounded in the region formed by the parabola $y^2 = 16x$ and $x = 9$, then $y^2 - 16x < 0, x - 9 < 0$

$$\Rightarrow 36a^2 - 16 \cdot 9a < 0, 9a - 9 < 0$$

$$\Rightarrow 36a(a - 4) < 0, a < 1$$

$$0 < a < 4, a < 1 \Rightarrow 0 < a < 1$$

3 (b)

It is given that the coordinates of the vertices are $A'(-6, 1)$ and $A(4, 1)$. So, centre of the ellipse is at $C(-1, 1)$ and length of major axis is $2a = 10$

Let e be the eccentricity of the ellipse. Then, coordinates its focus on the right side of centre are $(ae, 1)$ or $(5e, 1)$

It is given that $2x - y - 5 = 0$ is a focal chord of the ellipse.

So, it passes through $(5e, 1)$

$$\therefore 10e - 1 - 5 = 0 \Rightarrow e = \frac{3}{5}$$

$$\text{So, } b^2 = a^2(1 - e^2) = 25 \left(1 - \frac{9}{25}\right) = 16$$

Hence, the equation of the ellipse is

$$\frac{(x + 1)^2}{25} + \frac{(y - 1)^2}{16} = 1$$

4 (a)

$$\text{Given, } r = \sqrt{3} \sin \theta + \cos \theta$$

$$\text{Put } x = r \cos \theta, y = r \sin \theta$$

$$\therefore r = \sqrt{3} \frac{y}{r} + \frac{x}{r}$$

$$\Rightarrow r^2 = \sqrt{3}y + x$$

$$\Rightarrow x^2 + y^2 - \sqrt{3}y - x = 0$$

$$\therefore \text{Radius} = \sqrt{\left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{2}\right)^2} = 1$$

5 (b)

We have,

$$2\left(\frac{b^2}{4}\right) = \frac{9}{2} \Rightarrow b^2 = 9 \Rightarrow 16(e^2 - 1) = 9$$

$$\Rightarrow 16e^2 = 25 \Rightarrow e = \frac{5}{4}$$

6 (c)

Form right ΔOSB

$$\tan 0^\circ = \frac{b}{ae}$$

$$\Rightarrow \sqrt{3} = \frac{b}{ae}$$

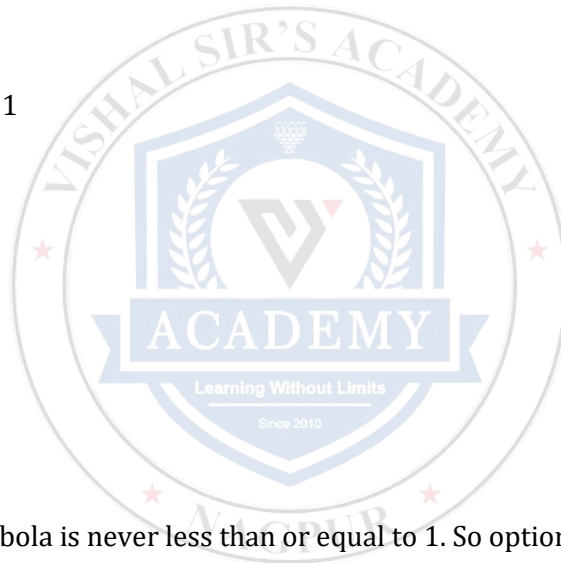
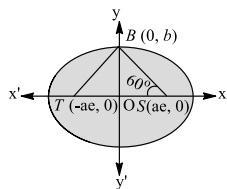
$$\Rightarrow b = \sqrt{3} ae$$

$$\text{Also, } b^2 = a^2(1 - e^2)$$

$$\Rightarrow 3a^2e^2 = a^2(1 - e^2)$$

$$\Rightarrow 3e^2 = 1 - e^2 \Rightarrow 4e^2 = 1$$

$$\Rightarrow e = \frac{1}{2}$$



7 (b)

The eccentricity of a hyperbola is never less than or equal to 1. So option (b) is correct

8 (d)

The equation of the tangent at (α, β) to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is $\frac{ax}{a^2} - \frac{\beta y}{b^2} = 1$

The ordinates of the points of intersection of this tangent and the auxiliary circle $x^2 + y^2 = a^2$ are the roots of the equation

$$\left\{ \frac{a^2}{\alpha} \left(1 + \frac{\beta y}{b^2} \right) \right\}^2 + y^2 = a^2$$

$$\Rightarrow \frac{a^4}{\alpha^2} \left(1 + \frac{\beta^2 y^2}{b^4} + \frac{2\beta y}{b^2} \right) + y^2 = a^2$$

$$\Rightarrow y^2 \left(\frac{\alpha^2}{a^4} + \frac{\beta^2}{b^4} \right) + \frac{2\beta}{b^2} y - \frac{\alpha^2}{a^2} + 1 = 0$$

Clearly, y_1 and y_2 are the roots of this equation

$$\begin{aligned} \therefore y_1 + y_2 &= -\frac{2\beta/b^2}{\frac{\alpha^2}{a^4} + \frac{\beta^2}{b^4}} \text{ and } y_1 y_2 = \frac{1 - \frac{\alpha^2}{a^2}}{\frac{\alpha^2}{a^4} + \frac{\beta^2}{b^4}} \\ \Rightarrow \frac{1}{y_1} + \frac{1}{y_2} &= \frac{-2\beta/b^2}{1 - \frac{\alpha^2}{a^2}} = \frac{-2\beta/b^2}{-\frac{\beta^2}{b^2}} \left[\because \frac{\alpha^2}{a^2} - \frac{\beta^2}{b^2} = 1 \right] \\ \Rightarrow \frac{1}{y_1} + \frac{1}{y_2} &= \frac{2}{\beta} \end{aligned}$$

9 **(a)**

Given hyperbola is a rectangular hyperbola whose eccentricity is $\sqrt{2}$

10 **(a)**

Since, the given line touches the given circle, the length of the perpendicular from the centre (2, 4) of the circle to the line $3x - 4y - k = 0$ is equal to the radius $\sqrt{4 + 16 + 5} = 5$ of the circle

$$\therefore \frac{3 \times 2 - 4 \times 4 - k}{\sqrt{9 + 16}} = \pm 5$$

$$\Rightarrow k = 15 \quad (\because k > 0)$$

Now, equation of the tangent at (a, b) to the given circle is

$$xa + yb - 2(x + a) - 4(y + b) - 5 = 0$$

$$\Rightarrow (a - 2)x + (b - 4)y - (2a + 4b + 5) = 0$$

If it represents the given line $3x - 4y - k = 0$

$$\text{Then, } \frac{a-2}{3} = \frac{b-4}{-4} = \frac{2a+4b+5}{k} = l \quad (\text{say})$$

$$\Rightarrow a = 3l + 2, b = 4 - 4l$$

$$\text{and } 2a + 4b + 5 = kl$$

$$\Rightarrow 2(3l + 2) + 4(4 - 4l) + 5 = 15l \quad (\because k = 15)$$

$$\Rightarrow l = 1 \Rightarrow a = 5, b = 0$$

$$\therefore k + a + b = 15 + 5 + 0 = 20$$

11 **(a)**

Since, the distance between the focus and directrix of the parabola is half of the length of the latusrectum. Therefore length of latusrectum = 2 (length of the perpendicular from (3, 3) to $3x - 4y - 2 = 0$)

$$= 2 \left| \frac{9 - 12 - 2}{\sqrt{9 + 16}} \right| = 2 \cdot \frac{5}{5} = 2$$

12 **(a)**

Given equation of circle is

$$x^2 + y^2 - 2x - 6y + 6 = 0 \dots(i)$$

$$\text{Its centre is (1, 3) and radius} = \sqrt{1 + 9 - 6} = 2$$

Equation of any line through (0, 1) is

$$y - 1 = m(x - 0)$$

$$\Rightarrow mx - y + 1 = 0 \dots(ii)$$

If it touches the circle (i), then the length of perpendicular from centre (1, 3) to the circle is equal to radius 2

$$\begin{aligned}\therefore \frac{m-3+1}{\sqrt{m^2+1}} &= \pm 2 \\ \Rightarrow (m-2)^2 &= 4(m^2+1) \\ \therefore m &= 0, -\frac{4}{3}\end{aligned}$$

On substituting these values of m in Eq. (ii), the required tangent are $y - 1 = 0$ and $4x + 3y - 3 = 0$

13 (d)

The centres of given circles are $C_1(-3, -3)$ and $C_2(6, 6)$ respectively and radii are $r_1 = \sqrt{9+9+0} = 3\sqrt{2}$ and $r_2 = \sqrt{36+36+0} = 6\sqrt{2}$ respectively

$$\text{Now, } C_1C_2 = \sqrt{(6+3)^2 + (6+3)^2} = 9\sqrt{2}$$

$$\text{and } r_1 + r_2 = 3\sqrt{2} + 6\sqrt{2} = 9\sqrt{2}$$

$$\Rightarrow C_1C_2 = r_1 + r_2$$

$\therefore$ Both circles touch each other externally

14 (a)

Let $A \equiv (at_1^2, 2at_1)$, $B \equiv (at_2^2, 2at_2)$

Tangents, at A and B will intersect at the point C , whose coordinate is given by $\{at_1t_2, a(t_1 + t_2)\}$.

Clearly, ordinates of A, C and B are always in AP

15 (c)

The pair of asymptotes and second degree curve differ by a constant.

$\therefore$ Pair of asymptotes is

$$2x^2 + 5xy + 2y^2 - 11x - 7y + \lambda = 0 \dots (i)$$

Hence, Eq. (i) represents a pair of straight lines.

$$\therefore \Delta = 0$$

$$\Rightarrow 2 \times 2 \times \lambda + 2 \times -\frac{7}{2} \times -\frac{11}{2} \times \frac{5}{2} - 2 \times \left(-\frac{7}{2}\right)^2 - 2 \times \left(-\frac{11}{2}\right)^2 - \lambda \times \left(\frac{5}{2}\right)^2 = 0$$

$$\Rightarrow \lambda = 5$$

From Eq.(i), pair of asymptotes is

$$2x^2 + 5xy + 2y^2 - 11x - 7y + 5 = 0$$

16 (b)

Since, the given circles cut each other orthogonally

$$\therefore g_1g_2 + a^2 = 0 \dots (i)$$

If $lx + my = 1$ is a common tangent of these circles, then

$$\frac{-lg_1 - 1}{\sqrt{l^2 + m^2}} = \pm \sqrt{g_1^2 + a^2}$$

$$\Rightarrow (lg_1 + 1)^2 = (l^2 + m^2)(g_1^2 + a^2)$$

$$\Rightarrow m^2g_1^2 - 2lg_1 + a^2(l^2 + m^2) - 1 = 0$$

$$\text{Similarly, } m^2g_2^2 - 2lg_2 + a^2(l^2 + m^2) - 1 = 0$$

So, that g_1, g_2 are the roots of the equation

$$m^2g^2 - 2lg + a^2(l^2 + m^2) - 1 = 0$$

$$\Rightarrow g_1 g_2 = \frac{a^2(l^2+m^2)-1}{m^2} = -a^2 \quad [\text{from Eq. (i)}]$$

$$\Rightarrow a^2(l^2 + m^2) = 1 - a^2 m^2 \quad \dots(\text{ii})$$

$$\begin{aligned} \text{Now, } p_1 p_2 &= \frac{|ma-1|}{\sqrt{l^2+m^2}} \cdot \frac{|-ma-1|}{\sqrt{l^2+m^2}} \\ &= \frac{|1-m^2 a^2|}{l^2+m^2} = a^2 \quad [\text{from Eq. (ii)}] \end{aligned}$$

17 (b)

If $(a \cos \alpha, b \sin \alpha)$ and $(a \cos \beta, b \sin \beta)$ are the end points of chord, then equation of chord is

$$\frac{x}{a} \cos\left(\frac{\alpha + \beta}{2}\right) + \frac{y}{b} \sin\left(\frac{\alpha + \beta}{2}\right) = \cos\left(\frac{\alpha - \beta}{2}\right)$$

If it is a focal chord, it passes through $(ae, 0)$, so

$$e \cos\left(\frac{\alpha + \beta}{2}\right) = \cos\left(\frac{\alpha - \beta}{2}\right)$$

$$\Rightarrow e = \frac{\cos\left(\frac{\alpha - \beta}{2}\right)}{\cos\left(\frac{\alpha + \beta}{2}\right)}$$

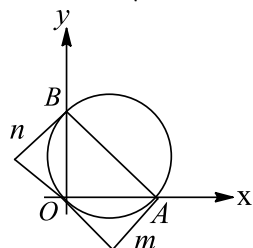
18 (d)

Let the equation of circle be

$$x^2 + y^2 + 2gx + 2fy = 0$$

(passing through origin)

$$\text{Radius} = \sqrt{g^2 + f^2}$$



Now, equation of tangents at $O(0, 0)$ is

$$x(0) + y(0) + g(x) + f(y) = 0$$

$$\Rightarrow gx + fy = 0$$

$$\text{Distance from } A(2g, 0) = \frac{2g^2}{\sqrt{g^2+f^2}} = m$$

$$\text{and distance from } B(0, 2f) = \frac{2f^2}{\sqrt{g^2+f^2}} = n$$

$$\Rightarrow \frac{2r^2}{r} = m + n \Rightarrow 2r = m + n$$

19 (c)

We know that every line passing through the focus of a parabola intersects the parabola in two distinct points except lines parallel to the axis.

The equation $(y - 2)^2 = 4(x + 1)$ represents a parabola with vertex $(-1, 2)$ and axis parallel to x -axis. So, the line of slope m will cut the parabola in two distinct points if $m \neq 0$ i.e.



$$m \in (-\infty, 0) \cup (0, \infty)$$

20 **(a)**

Given that, any tangent to the circle $x^2 + y^2 = b^2$ is $y = mx - b\sqrt{1 + m^2}$. It touches the circle $(x - a)^2 + y^2 = b^2$, then

$$\frac{ma - b\sqrt{1 + m^2}}{\sqrt{m^2 + 1}} = b$$

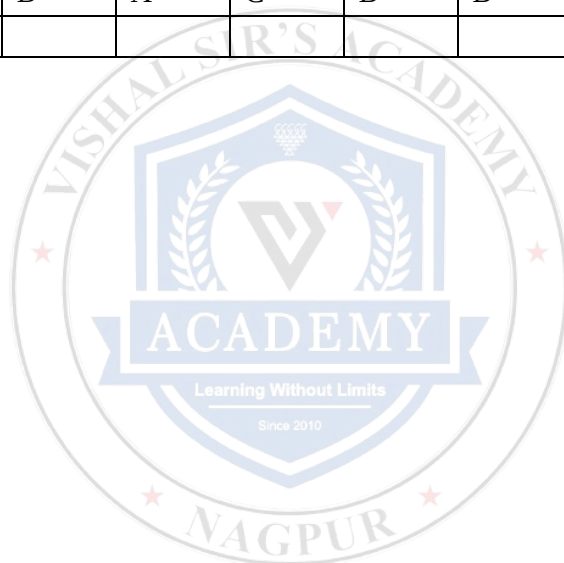
$$\Rightarrow ma = 2b\sqrt{1 + m^2}$$

$$\Rightarrow m^2 a^2 = 4b^2 + 4b^2 m^2$$

$$\therefore m = \pm \frac{2b}{\sqrt{a^2 - 4b^2}}$$



ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	D	A	B	A	B	C	B	D	A	A
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	A	D	A	C	B	B	D	C	A



SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

CLASS : XIth

DATE :

Solutions

SUBJECT : MATHS

DPP NO. : 8

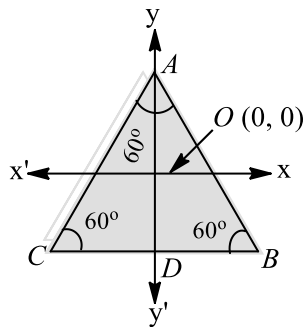
Topic :- CONIC SECTION

1 (d)

Centre of triangle is (0, 0)

Since, triangle is an equilateral, the centre of circumcircle is also (0, 0)

$AD = a$ (given)



$$\therefore AC = BC = AB$$

$$= \frac{a}{\sin 60^\circ} = \frac{2a}{\sqrt{3}}$$

$$\therefore \text{Circumradius} = \frac{AC}{2 \sin B}$$

$$= \frac{2a}{2\sqrt{3}} \times \frac{2}{\sqrt{3}} = \frac{2a}{3} \quad [\because B = 60^\circ]$$

$\therefore$ required equation of circumcircle is

$$x^2 + y^2 = \frac{4a^2}{9}$$

$$\Rightarrow 9x^2 + 9y^2 = 4a^2$$

2 (a)

The coordinates of end point of latusrectum are $(a, 2a)$ and $(a, -2a)$ ie, $(3, 6)$ and $(3, -6)$

The equation of directrix is $x = -3$

The equation of tangents from the above points are $6y = 6(x + 3)$ and $-6y = 6(x + 3)$

$$\Rightarrow x - y + 3 = 0 \text{ and } x + y + 3 = 0$$

The intersection point is $(-3, 0)$

The equation of directrix of the parabola $y^2 = 12x$ is $x = -3$

$\Rightarrow$ Intersection point $(-3, 0)$ lies on the directrix



3 (c)

We have, $\frac{x^2}{25} + \frac{y^2}{9} = 1$

The eccentricity of this ellipse is $\frac{4}{5}$. So, the coordinates of foci S and S' are $(4,0)$ and $(-4,0)$

$\therefore$ Area of rhombus $= \frac{1}{2} \times \text{Product of diagonals}$

$\Rightarrow$ Area of rhombus $= \frac{1}{2} (BB' \times SS')$

$\Rightarrow$ Area of rhombus $= \frac{1}{2} \times 6 \times 8 \text{ sq. units} = 24 \text{ sq. units}$

4 (d)

Let the equation of ellipse be

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

$$\therefore b^2 = a^2(1 - e^2)$$

$$\therefore \frac{x^2}{a^2} + \frac{y^2}{a^2(1 - e^2)} = 1$$

5 (d)

Any point on the line $x - y - 5 = 0$ will be of the form $(t, t - 5)$ Chord of contact of this point with respect to curve $x^2 + 4y^2 = 4$ is

$$tx + 4(t - 5)y - 4 = 0$$

$$\Rightarrow (-20y - 4) + t(x + 4y) = 0$$

Which is a family of straight lines, each member of this family pass through point of intersection of straight lines $-20y - 4 = 0$ and $x + 4y = 0$ which is $\left(\frac{4}{5}, -\frac{1}{5}\right)$

6 (a)

The combined equation of the lines joining the origin (vertex) to the points of intersection of $y^2 = 4ax$ and $y = mx + c$ is

$$y^2 = 4ax \left(\frac{y - mx}{c} \right) \Rightarrow cy^2 - 4axy + 4amx^2 = 0$$

This represents a pair of perpendicular lines

$$\therefore c + 4am = 0 \Rightarrow c = -4am$$

7 (b)

Let the point on $x^2 + y^2 = a^2$ is $(a \cos \theta, a \sin \theta)$

Equation of chord of contact is

$$ax \cos \theta + ay \sin \theta = b^2$$

It touches circle $x^2 + y^2 = c^2$

$$\therefore \left| \frac{-b^2}{\sqrt{a^2 \cos^2 \theta + a^2 \sin^2 \theta}} \right| = c$$

$$\Rightarrow b^2 = ac$$

$\therefore a, b, c$ are in GP

8 (d)

We have,

$$y^2 = 4ax \Rightarrow \left(\frac{dy}{dx}\right)_{(x_1, y_1)} = \frac{2a}{y_1}$$

∴ Length of the sub-normal at $P(x_1, y_1)$

$$= y_1 \left(\frac{dy}{dx}\right)_P = y_1 \times \frac{2a}{y_1} = 2a$$

9 (b)

Let $P(h, k)$ be the point such that the ratio of the squares of the lengths of the tangents from P to the circles $x^2 + y^2 + 2x - 4y - 20 = 0$ and $x^2 + y^2 - 4x + 2y - 44 = 0$ is $2 : 3$.

Then,

$$\frac{h^2 + k^2 + 2h - 4k - 20}{h^2 + k^2 + 4h + 2k - 44} = \frac{2}{3}$$

$$\Rightarrow h^2 + k^2 + 14h - 16k + 22 = 0$$

So, the locus of $P(h, k)$ is $x^2 + y^2 + 14x - 16y + 22 = 0$

Clearly, it represents a circle having its centre at $(-7, 8)$

10 (a)

The intersection of given line and circle is

$$x^2 + y^2 - 2x = 0$$

$$\Rightarrow 2x(x - 1) = 0$$

$$\Rightarrow x = 0, x = 1$$

And $y = 0, 1$

Let coordinates of A are $(0, 0)$ and coordinates of B are $(1, 1)$.

∴ Equation of circle (AB as a diameter) is

$$(x - x_1)(x - x_2) + (y - y_1)(y - y_2) = 0$$

$$\Rightarrow (x - 0)(x - 1) + (y - 0)(y - 1) = 0$$

$$\Rightarrow x^2 + y^2 - x - y = 0$$

11 (c)

Equation of normal to hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ at

$$(a \sec \theta, b \tan \theta) \text{ is } \frac{ax}{\sec \theta} + \frac{by}{\tan \theta} = a^2 + b^2$$

12 (c)

The equation of tangent to the given circle $2x^2 + 2y^2 - 2x - 5y + 3 = 0$ at point $(1, 1)$ is

$$2x + 2y - (x + 1) - \frac{5}{2}(y + 1) + 3 = 0$$

$$\Rightarrow x - \frac{1}{2}y - \frac{1}{2} = 0$$

$$\Rightarrow 2x - y - 1 = 0$$

$$\Rightarrow y = 2x - 1$$

Slope of tangent = 2, therefore slope of normal = $-\frac{1}{2}$

Hence, equation of normal at point $(1, 1)$ and having slope $\left(-\frac{1}{2}\right)$ is

$$y - 1 = -\frac{1}{2}(x - 1)$$

$$\Rightarrow 2y - 2 = -x + 1$$

$$\Rightarrow x + 2y = 3$$

13 **(b)**

The product of perpendicular distance from any point on $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ to its asymptotes is $\frac{a^2 b^2}{a^2 + b^2}$ (See illustration 3 on page 26.12)

$$\therefore \text{Required product} = \frac{16 \times 9}{16 + 9} = \frac{144}{25}$$

14 **(c)**

$x^2 = 4y$ and $y^2 = 4x$ intersect at $O(0,0)$ and $(4,4)$. Therefore, the coordinates of P are $(4,4)$. The equations of the tangents to the two parabolas at $(4,4)$ are :

$$2x - y - 4 = 0 \quad \dots(i)$$

$$\text{and, } x - 2y + 4 = 0 \quad \dots(ii)$$

Now, $m_1 = \text{Slope of (i)} = 2, m_2 = \text{Slope of (ii)} = 1/2$

$$\text{Clearly, } m_1 m_2 = 1$$

$$\Rightarrow \tan \theta_1 \tan \theta_2 = 1$$

$$\Rightarrow \tan \theta_1 = \cot \theta_2$$

$$\Rightarrow \theta_1 \text{ and } \theta_2 \text{ are such that } \theta_1 + \theta_2 = \pi/2$$

15 **(c)**

The equation of a second degree curve passing through the points of intersection of the lines $2x - y + 11 = 0$ and $x - 2y + 3 = 0$ with the coordinate axes is

$$(2x - y + 11)(x - 2y + 3) + \lambda xy = 0 \quad \dots(i)$$

This equation will represent a circle, if

$$\text{Coeff. of } x^2 = \text{Coeff. of } y^2 \text{ and Coeff. of } xy = 0$$

$$\Rightarrow \lambda - 5 = 0 \Rightarrow \lambda = 5$$

Putting the value of λ in (i), we obtain that the equation of the circle is

$$(2x - y + 11)(x - 2y + 3) + 5xy = 0$$

$$\Rightarrow 2x^2 + 2y^2 + 7x - 5y + 3 = 0$$

The coordinates of its centre are $(-7/2, 5/2)$

16 **(a)**

$$\text{Given, } \frac{x^2}{16} + \frac{y^2}{9} = 1$$

$$\therefore e = \sqrt{1 - \frac{9}{16}} = \frac{\sqrt{7}}{4}$$

$$\therefore \text{Coordinates of foci are } (\pm\sqrt{7}, 0)$$

Since, centre of circle is $(0, 3)$ and passing through foci $(\pm\sqrt{7}, 0)$

$$\therefore \text{Radius of circle} = \sqrt{(0 \pm \sqrt{7})^2 + (3 - 0)^2}$$

$$= \sqrt{7+9} = 4$$

17 (b)

Given equation of curve is $x = \alpha + 5 \cos \theta$, $y = \beta + 4 \sin \theta$

$$\text{Or } \cos \theta = \frac{x-\alpha}{5}, \sin \theta = \frac{y-\beta}{4}$$

$$\therefore \cos^2 \theta + \sin^2 \theta = 1$$

$$\Rightarrow \left(\frac{x-\alpha}{5}\right)^2 + \left(\frac{y-\beta}{4}\right)^2 = 1$$

This represents the equation of an ellipse.

18 (b)

Let PQ be a focal chord of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ having focus S . Then,

$$\frac{2 SP \cdot SQ}{SP + SQ} = \frac{b^2}{a} \Rightarrow \frac{2pq}{p+q} = \frac{b^2}{a} \Rightarrow b^2(p+q) = 2apq$$

19 (c)

Given, parametric equations are $x = e^t + e^{-t}$ and $y = e^t - e^{-t}$

Now, on squaring and then on subtracting, we get

$$x^2 - y^2 = 4$$

20 (c)

Intersection points of given circles are $(0, 0)$ and $(3, 3)$ let equation of required circle whose centre $\left(\frac{3}{2}, \frac{3}{2}\right)$, is

$$x^2 + y^2 - 3x - 3y + c = 0$$

Since, this circle passes through $(0, 0)$, thus equation of circle becomes,

$$x^2 + y^2 - 3x - 3y = 0$$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	D	A	C	D	D	A	B	D	B	A
Q.	11	12	13	14	15	16	17	18	19	20
A.	C	C	B	C	C	A	B	B	C	C



SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

CLASS : XIth
DATE :

Solutions

SUBJECT : MATHS
DPP NO. : 9

Topic :- CONIC SECTION

1 **(b)**

Equation of circle is

$$x^2 + y^2 = 25 \quad \dots(i)$$

Polar equation of a circle with respect to the point $(1, a)$ and $(b, 2)$ is

$$x + ay = 25 \quad \dots(ii)$$

$$\text{and } bx + 2y = 25 \quad \dots(iii)$$

since, $(1, a)$ and $(b, 2)$ are the conjugate point of a circle, therefore point $(1, a)$ satisfy the Eq. (iii), we get

$$b + 2a = 25 \Rightarrow 2b + 4a = 50$$

3 **(a)**

$$\text{Given, } \frac{x^2}{16} - \frac{y^2}{9} = 1$$

We know that the difference of focal distances of any point of the hyperbola is equal to major axis

$$\therefore \text{Required distance} = 2a = 2 \times 4 = 8$$

4 **(a)**

We have,

$$y^2 - 6y + 4x + 9 = 0 \Rightarrow (y - 3)^2 = -4(x - 0)$$

The coordinate of the focus of this parabola are $(-1, 3)$ and the equation of the directrix is $x - 1 = 0$

We know that the chord of contact of tangents drawn from any point on the directrix always passes through the focus.

Hence, the required point is $(-1, 3)$

ALITER Let $P(1, \lambda)$ be an arbitrary point on $x - 1 = 0$. The chord of contact of tangents drawn from $P(1, \lambda)$ to the parabola $y^2 - 6y + 4x + 9 = 0$ is

$$\lambda y - 3(y + \lambda) + 2(x + 1) + 9 = 0$$

$$\Rightarrow (2x - 3y + 11) + \lambda(y - 3) = 0$$

Clearly, it represents a family of lines passing through the intersection of the lines

$$2x - 3y + 11 = 0 \text{ and } y - 3 = 0 \text{ i.e. } (-1, 3)$$

5 **(b)**

Equation of circle whose centre is at $(2, 2)$ and radius r is

$$(x - 2)^2 + (y - 2)^2 = r^2 \quad \dots(i)$$

This circle passes through (4, 5), then

$$(4 - 2)^2 + (5 - 2)^2 = r^2$$

$$\Rightarrow r^2 = 13$$

On putting this values in Eq. (i), we get

$$(x - 2)^2 + (y - 2)^2 - 13 = 0$$

$$\Rightarrow x^2 + y^2 - 4x - 4y - 5 = 0$$

6 **(d)**

The equations of asymptotes of $x^2 - y^2 = 8$ are given by

$$x^2 - y^2 = 0 \text{ or, } x + y = 0 \text{ and } x - y = 0$$

Let (x_1, y_1) be a point on the hyperbola $x^2 - y^2 = 8$. Then, product of perpendicular from (x_1, y_1) on the asymptotes

$$= \left| \frac{x_1 - y_1}{\sqrt{2}} \right| \left| \frac{x_1 + y_1}{\sqrt{2}} \right|$$

$$= \left| \frac{x_1^2 - y_1^2}{2} \right| = \left| \frac{8}{2} \right| = 4 \quad [\because x_1^2 - y_1^2 = 8]$$

7 **(d)**

Given foci of ellipse are (0, -4) and (0, 4)

$\therefore$ Focal distance is $2be = 8$

$$be = 4 \quad \dots(i)$$

Also, since equation of directrices are $\frac{b}{e} = \pm 9 \dots(ii)$

From, Eqs. (i) and (ii), we get

$$b^2 = 36 \Rightarrow b = 6 \text{ and } e = \frac{2}{3}$$

$$\therefore a^2 = b^2(1 - e^2) = 36 \left(1 - \frac{4}{9}\right) = 20$$

$$\therefore \frac{x^2}{20} + \frac{y^2}{36} = 1$$

$$\Rightarrow 9x^2 + 5y^2 = 180$$

8 **(a)**

The equation of tangent is

$$\frac{x}{a} \sec \theta - \frac{y}{b} \tan \theta = 1$$

$\therefore$ Coordinates of A and B are $(a \cos \theta, 0)$ and $(0, -b \cot \theta)$ respectively.

Let coordinates of P are (h, k) .

$$\therefore h = a \cos \theta, k = -b \cot \theta$$

$$\Rightarrow \frac{k}{h} = -\frac{b}{a \sin \theta}$$

$$\begin{aligned}\Rightarrow \sin \theta &= -\frac{bh}{ak} \\ \Rightarrow \frac{b^2 h^2}{a^2 k^2} &= \sin^2 \theta \\ \Rightarrow \frac{b^2 h^2}{a^2 k^2} + \frac{h^2}{a^2} &= 1 \\ \Rightarrow \frac{b^2}{k^2} + 1 &= \frac{a^2}{h^2} \\ \Rightarrow \frac{a^2}{h^2} - \frac{b^2}{k^2} &= 1\end{aligned}$$

Hence, the locus of P is $\frac{a^2}{x^2} - \frac{b^2}{y^2} = 1$

9 **(d)**

The coordinates of P are $(1, 0)$. A general point Q on $y^2 = 8x$ is $(2t^2, 4t)$. Let mid point of PQ is (h, k)

$$\therefore 2h = 2t^2 + 1 \text{ and } 2k = 4t \Rightarrow t = \frac{k}{2}$$

$$\therefore 2h = \frac{2k^2}{4} + 1 \Rightarrow 4h = k^2 + 2$$

Hence, the locus of (h, k) is $y^2 - 4x + 2 = 0$

11 **(a)**

The equation of the ellipse is

$$\frac{(x+3)^2}{2^2} + \frac{(y-5)^2}{(\sqrt{3})^2} = 1$$

$$\Rightarrow 3x^2 + 4y^2 + 18x - 40y + 115 = 0$$

12 **(c)**

Let (h, k) be the pole of the line $9x + y - 28 = 0$ with respect to the circle $x^2 + y^2 - \frac{3}{2}x + \frac{5}{2}y - \frac{7}{2} = 0$. Then, the equation of the polar is

$$hx + ky - \frac{3}{4}(x+h) + \frac{5}{4}(y+k) - \frac{7}{2} = 0$$

$$\Rightarrow x\left(h - \frac{3}{4}\right) + y\left(k + \frac{5}{4}\right) - \frac{3}{4}h + \frac{5}{4}k - \frac{7}{2} = 0$$

$$\Rightarrow x(4h - 3) + y(4k + 5) - 3h + 5k - 14 = 0$$

This equation and $9x + y - 28 = 0$ represent the same line.

$$\therefore \frac{4h-3}{9} = \frac{4k+5}{1} = \frac{-3h+5k-14}{-28} = \lambda \text{ (say)}$$

$$\Rightarrow h = \frac{3+9\lambda}{4}, k = \frac{\lambda-5}{4}, -3h+5k-14 = -28\lambda$$

$$\Rightarrow -3\left(\frac{3+9\lambda}{4}\right) + 5\left(\frac{\lambda-5}{4}\right) - 14 = -28\lambda$$

$$\Rightarrow -9 - 27\lambda + 5\lambda - 25 - 56 = -112\lambda$$

$$\Rightarrow -22\lambda - 90 = -112\lambda$$

$$\Rightarrow 90\lambda = 90 \Rightarrow \lambda = 1$$

Hence, the pole of the given line is $(3, -1)$

13 **(a)**

Let (h, k) is mid point of chord.

Then, its equation is $T = S_1$

$$\therefore 3hx - 2ky + 2(x + h) - 3(y + k) = 3h^2 - 2k^2 + 4h - 6k$$

$$x(3h + 2) + y(-2k - 3) = 3h^2 - 2k^2 + 2h - 3k$$

Since, this line is parallel to $y = 2x$

$$\frac{3h + 2}{-2k - 3} = 2$$

$$\Rightarrow 3h - 4k = 4$$

Thus, locus of point is $3x - 4y = 4$

14 **(b)**

If circle $x^2 + y^2 - 10x - 14y + 24 = 0$ cuts an intercept on y -axis, then

$$\text{Length of intercept} = 2\sqrt{f^2 - c} = 2\sqrt{49 - 24} = 10$$

15 **(a)**

Given line $y = ax + \beta$ is a tangent to given hyperbola, if $\beta^2 = a^2\alpha^2 - b^2$

Hence, locus of (α, β) is $y^2 = a^2x^2 - b^2$, which represents a hyperbola

16 **(c)**

Let the points are (x_1, y_1) , (x_2, y_2) and (x_3, y_3)

$$\therefore y_1^2 = 4ax_1, y_2^2 = 4ax_2, y_3^2 = 4ax_3$$

$\therefore$ Area of triangle whose vertices are (x_1, y_1) , (x_2, y_2) and (x_3, y_3)

$$= \frac{1}{2} \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \frac{1}{2} \begin{vmatrix} \frac{y_1^2}{4a} & y_1 & 1 \\ \frac{y_2^2}{4a} & y_2 & 1 \\ \frac{y_3^2}{4a} & y_3 & 1 \end{vmatrix} = \frac{1}{8a} \begin{vmatrix} y_1^2 & y_1 & 1 \\ y_2^2 & y_2 & 1 \\ y_3^2 & y_3 & 1 \end{vmatrix}$$

$\Rightarrow$ Area of triangle

$$= \frac{1}{8a} (y_1 - y_2)(y_2 - y_3)(y_3 - y_1)$$

17 **(c)**

Let $y = mx + \frac{a}{m}$ be a tangent to $y^2 = 4ax$ cutting $y^2 = -4ax$ at P and Q . Let (h, k) be mid-point of PQ . Then, equation of PQ is

$$ky + 2a(x + h) = k^2 + 4ah \quad [\text{Using : } T = S']$$

$$\text{or, } ky = -2ax + k^2 + 2ah$$

But, equation of PQ is

$$y = mx + \frac{a}{m}$$

$$\therefore m = -\frac{2a}{k} \text{ and } \frac{k^2 + 2ah}{k} = \frac{a}{m}$$

$$\Rightarrow -\frac{2a}{k}(k^2 + 2ah) = ak$$

$$\Rightarrow -2(k^2 + 2ah) = k^2 \Rightarrow 3k^2 + 4ah = 0$$

Hence, the locus of (h, k) is $3y^2 + 4ax = 0$ or, $y^2 = -\frac{4a}{3}x$

18 **(b)**

Let $P(x_1, y_1)$ be a point on the hyperbola. Then the coordinates of N are $(x_1, 0)$

The equation of the tangent at (x_1, y_1) is $\frac{xx_1}{a^2} - \frac{yy_1}{b^2} = 1$

This meets x -axis at $T\left(\frac{a^2}{x_1}, 0\right)$

$$\therefore OT \cdot ON = \frac{a^2}{x_1} \times x_1 = a^2$$

20 **(a)**

The equation of circles whose radius is r and centres $(2, 3)$ and $(5, 6)$ is

$$(x - 2)^2 + (y - 3)^2 = r^2$$

$$\text{And } (x - 5)^2 + (y - 6)^2 = r^2$$

$$\Rightarrow x^2 + y^2 - 4x - 6y + (-r^2 + 13) = 0$$

$$\text{And } x^2 + y^2 - 10x - 12y + (-r^2 + 61) = 0$$

Since, circles cut orthogonally, then

$$2g_1g_2 + 2f_1f_2 = c_1 + c_2$$

$$\Rightarrow 2(2)(5) + 2(3)(6) = 13 - r^2 + 61 - r^2$$

$$\Rightarrow 2r^2 = 18 \Rightarrow r = 3$$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	C	A	A	B	D	D	A	D	B
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	C	A	B	A	C	C	B	B	A



SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

CLASS : XIth
DATE :

Solutions

SUBJECT : MATHS
DPP NO. : 10

Topic :- CONIC SECTION

1 **(b)**

Given that, $S_1 \equiv x^2 + y^2 + 4x + 22y + c = 0$, bisects the circumference of the circle

$$S_2 \equiv x^2 + y^2 - 2x + 8y - d = 0$$

The common chord of the given circle is

$$S_1 - S_2 = 0$$

$$\text{ie, } 6x + 14y + c + d = 0 \quad \dots(i)$$

So, Eq. (i) passes through the centre of the second circle, ie, $(1, -4)$

$$\therefore 6 + 56 + c + d = 0$$

$$\Rightarrow c + d = -62$$

2 **(d)**

We have, $a^2 = 16, b^2 = 9$

$$\therefore e = \sqrt{1 - \frac{b^2}{a^2}} = \frac{\sqrt{7}}{4}$$

Coordinates of S are $(\sqrt{7}, 0)$. Therefore, $CS = \sqrt{7}$

$$\therefore CS : \text{Major axis} = \sqrt{7} : 2a = \sqrt{7} : 8$$

3 **(d)**

The given points are the ends of the latusrectum where the normals are always at right angle

4 **(a)**

Let (h, k) be the coordinates of the centre of circle C_2 . Then its equation is

$$(x - h)^2 + (y - k)^2 = 5^2$$

The equation of C_1 is $x^2 - y^2 = 4^2$ and so the equation of the common chord of C_1 and C_2 is

$$2hx + 2ky = h^2 + k^2 - 9 \quad \dots(i)$$

Let p be the length of the perpendicular from the centre $(0,0)$ of C_1 to (i). Then,

$$p = \frac{|h^2 + k^2 - 9|}{\sqrt{4h^2 + 4k^2}}$$

The length of the common chord is $2\sqrt{4^2 - p^2}$ which will be of maximum length, if

$$p = 0 \Rightarrow h^2 + k^2 - 9 = 0 \quad \dots(ii)$$

Now, Slope of common chord = $\frac{3}{4}$

$$\therefore -\frac{h}{k} = \frac{3}{4} \Rightarrow k = -\frac{4h}{3} \quad \dots(iii)$$

Putting the value of k in (ii), we get

$$h = \pm \frac{9}{5} \Rightarrow k = \mp \frac{12}{5} \quad [\text{From (iii)}]$$

Hence, the centres of circle C_2 are $(9/5, -12/5)$ and $(-9/5, 12/5)$

5 **(a)**

Equation of the normal at point $(bt_1^2, 2bt_1)$ on parabola is

$$y = -t_1x + 2bt_1 + bt_1^3$$

It is also passes through $(bt_2^2, 2bt_2)$, then

$$2bt_2 = t_1 \cdot bt_2^2 + 2bt_1 + bt_1^3$$

$$\Rightarrow 2t_2 - 2t_1 = t_1(t_1^2 - t_2^2)$$

$$\Rightarrow 2 = -t_1(t_2 + t_1)$$

$$\Rightarrow t_2 = -t_1 - \frac{2}{t_1}$$

6 **(a)**

Let the equation of tangent which is perpendicular to the line $3x + 4y = 7$, is $4x - 3y = \lambda \Rightarrow y = \frac{4}{3}x - \frac{\lambda}{3}$

Since, it is a tangent to the ellipse

$$\therefore \left(\frac{\lambda}{3}\right)^2 = 9 \times \left(\frac{4}{3}\right)^2 + 4 \quad [\because a^2 = 9, b^2 = 4]$$

$$\Rightarrow \lambda^2 = 180 \Rightarrow \lambda = \pm 6\sqrt{5}$$

$$\therefore \text{Equation is } 4x - 3y = \pm 6\sqrt{5}$$

7 **(d)**

Any point on the hyperbola

$$\frac{(x+1)^2}{16} - \frac{(y-2)^2}{4} = 1, \text{ is of the form}$$

$$(4 \sec \theta - 1, 2 \tan \theta + 2)$$

8 **(c)**

In the given equation we observe that the denominator of y^2 is greater than that of x^2 . So, the two foci lie on y-axis and their coordinates are $(0, \pm be)$, where

$$b = 5 \text{ and } e = \sqrt{1 - \frac{a^2}{b^2}} = \sqrt{1 - \frac{9}{25}} = \frac{4}{5}$$

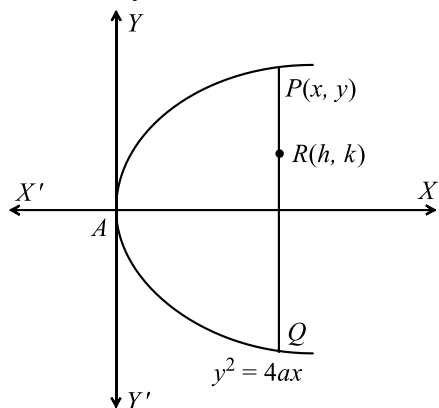
The focal distances of a point $P(x_1, y_1)$ on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, where $b^2 > a^2$ are given by $b \pm ey_1$

Hence, required distances $= b \pm ey_1 = 5 \pm \frac{4}{5}y_1$

9 (b)

Let PQ be a double ordinate of $y^2 = 4ax$, and let $R(h, k)$ be a point of trisection. Let the coordinates of P be (x, y) . Then,

$x = h$ and $y = 3k$



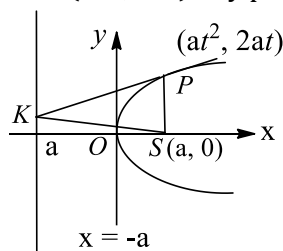
But, $(x - y)$ lies on $y^2 = 4ax$

$$\therefore 9k^2 = 4ah$$

Hence, the locus of (h, k) is $9y^2 = 4ax$

10 (d)

Let $P(at^2, 2at)$ any point on the parabola and focus is $(a, 0)$



The equation of tangent at P is $yt = x + at^2$

Since, it meets the directrix $x = -a$ at K

Then, the coordinate of K is $\left(-a, \frac{at^2 - a}{t}\right)$

$$\text{Slope of } SP = m_1 = \frac{2at}{a(t^2 - 1)}$$

$$\text{Slope of } SK = m_2 = \frac{a(t^2 - 1)}{-2at}$$

$$\therefore m_1 m_2 = \frac{2at}{a(t^2 - 1)} \cdot \frac{a(t^2 - 1)}{(-2at)} = -1$$

$$\therefore \angle PSK = 90^\circ$$

11 (d)

Since, $y = |x| + c$ and $x^2 + y^2 - 8|x| - 9 = 0$ both are symmetrical about y -axis for $x > 0$, $y = x + c$. Equation of tangent to circle $x^2 + y^2 - 8x - 9 = 0$ which is parallel to $y = x + c$ is $y = (x - 4) + 5\sqrt{1 + 1}$

$$\Rightarrow y = x + (5\sqrt{2} - 4)$$

For no solution $c > 5\sqrt{2} - 4$,

$$\therefore c \in (5\sqrt{2} - 4, \infty)$$

12 (d)

Centre is the point of intersection of two diameters, i.e., the point of intersection of two diameters is $C(8, -2)$, therefore the distance from the centre to the point $P(6, 2)$ is

$$r = CP = \sqrt{4 + 16} = \sqrt{20}$$

13 (a)

Only the point $(9, 3)$ lies on the given circle

14 (d)

The equation of a tangent of slope m to the circle $x^2 + y^2 = a^2$ is $y = mx \pm a\sqrt{1 + m^2}$ and the coordinates of point of contact are

$$\left(\mp \frac{am}{\sqrt{1 + m^2}}, \pm \frac{a}{\sqrt{1 + m^2}} \right)$$

Here, $a = 5$ and $m = \tan 30 = 1/\sqrt{3}$

So, the coordinates of the points of contact are $\left(\mp \frac{5}{2}, \pm \frac{5\sqrt{3}}{2} \right)$

15 (a)

$$\text{Given, } \frac{x^2}{32/5} + \frac{y^2}{32/9} = 1$$

Let the equation of tangent be $y = mx + c$

$$y = mx \pm \sqrt{\frac{32}{5}m^2 + \frac{32}{9}} \quad \dots (i)$$

$$[\because c^2 = a^2m^2 + b^2 \text{ for } a > b]$$

Since, $(2, 3)$ lies on Eq. (i)

$$\Rightarrow 3 = m \cdot 2 \pm \sqrt{\frac{32}{5}m^2 + \frac{32}{9}}$$

$$45(3 - 2m)^2 = 288m^2 + 160$$

$$\Rightarrow 108m^2 + 540m - 245 = 0$$

$$\therefore D = (540)^2 + 4 \cdot 180 \cdot 245 > 0 \Rightarrow D > 0$$

$\Rightarrow$ Two values of m will exist

$\Rightarrow$ Two tangents will exist

Alternate

$$\text{Let } S \equiv 5x^2 + 9y^2 - 32$$

Now, $S(2,3) \equiv 20 + 81 - 32 > 0$

$\therefore$ Point (2,3) lies outside ellipse

Thus, two tangents can be drawn

16 (d)

As we know equation of tangent to the given hyperbola at (x_1, y_1) is $xx_1 - 2yy_1 = 4$ which is same as $2x + \sqrt{6}y = 2$

$$\Rightarrow x_1 = 4 \text{ and } y_1 = \sqrt{6}$$

Thus, the point of contact is $(4, -\sqrt{6})$

17 (b)

Let (h, k) be the mid-point of a focal chord of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. Then, its equation is

$$\frac{hx}{a^2} + \frac{ky}{b^2} = \frac{h^2}{a^2} + \frac{k^2}{b^2}$$

It passes through the focus $S(ae, 0)$

$$\therefore \frac{he}{a} = \frac{h^2}{a^2} + \frac{k^2}{b^2}$$

Hence, the locus of (h, k) is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = \frac{xe}{a}$

18 (c)

$$\text{Given, } x = t^2 + 2t - 1 \quad \dots(i)$$

$$\text{and } y = 3t + 5 \Rightarrow t = \frac{y-5}{3} \quad \dots(ii)$$

On putting the value of t in Eq. (i), we get

$$x = \left(\frac{y-5}{3}\right)^2 + 2\left(\frac{y-5}{3}\right) - 1$$

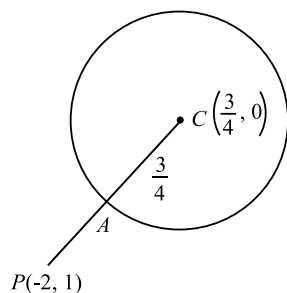
$$\Rightarrow x = \frac{1}{9}\{y^2 - 4y - 14\}$$

$$\Rightarrow (y-2)^2 = 9(x+2)$$

This is an equation of a parabola

19 (b)

We observe that the minimum distance between point P and the given circle is



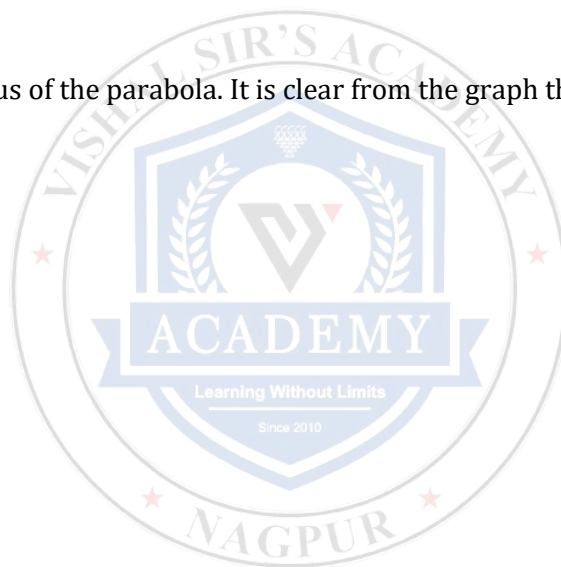
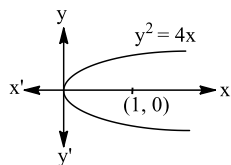
$$PA = CP - CA = \frac{\sqrt{137}}{4} - \frac{3}{4} = \frac{\sqrt{137} - 3}{4} > 2$$

So, there is no point on the circle whose distance from P is 2 units

20 (b)

Given curve is $y^2 = 4x$

Also, point $(1, 0)$ is the focus of the parabola. It is clear from the graph that only normal is possible



ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	D	D	A	A	A	D	C	B	D
Q.	11	12	13	14	15	16	17	18	19	20
A.	D	D	A	D	A	D	B	C	B	B

