SOLUTIONS Solution CONIC SECTION WORKSHEET-2



**Ans: 1** (1) $36x^2+4y^2=144$

$$\Rightarrow \frac{x^2}{4}+\frac{y^2}{36}=1$$

here $a=2$, $b=6$ $(b>a)$

(1) $e=\sqrt{1-\frac{a^2}{b^2}}=\sqrt{1-\frac{4}{36}}=\sqrt{1-\frac{1}{9}}=\sqrt{\frac{8}{9}}=\frac{2\sqrt{2}}{3}$

(2) foci $=(0,\pm be)=(0,\pm 4\sqrt{2})$

(3) vertices $=(0,\pm b)=(0,\pm 6)$

(4) Major Axis length $=2b=12$

(5) Minor Axis length $=2a=4$

(6) $LR=\frac{2a^2}{b}=\frac{2(4)}{6}=\frac{4}{3}$ Ans

(2) $4x^2+9y^2=36$

$$\Rightarrow \frac{x^2}{9}+\frac{y^2}{4}=1$$

here $a=3$ & $b=2$ $(a>b)$

(1) $e=\sqrt{1-\frac{b^2}{a^2}}=\sqrt{1-\frac{4}{9}}=\sqrt{\frac{5}{9}}=\frac{\sqrt{5}}{3}$

(2) foci $=(\pm ae,0)=(\pm\sqrt{5},0)$

(3) vertices $=(\pm a,0)=(\pm 3,0)$

(4) Major Axis length $=2a=6$

(5) Minor Axis length $=2b=4$

(6) $LR=\frac{2b^2}{a}=\frac{2(4)}{3}=\frac{8}{3}$ Ans

**Ans :2** (i) $16x^2-9y^2=576$

$\Rightarrow \frac{x^2}{36}-\frac{y^2}{64}=1$

It is a transverse hyperbola
with $a=6$ & $b=8$

(1) $e=\sqrt{1+\frac{b^2}{a^2}}=\sqrt{1+\frac{64}{36}}=\sqrt{\frac{100}{36}}=\frac{10}{6}=\frac{5}{3}$

(2) foci $=(\pm ae,0)=(\pm 10,0)$

(3) vertices $=(\pm a,0)=(\pm 6,0)$

(4) LR $=\frac{2b^2}{a}=\frac{2(64)}{6}=\frac{64}{3}$ Ans

(2) $49y^2-16x^2=784$

$\Rightarrow \frac{-16x^2}{784}+\frac{49y^2}{784}=1$

$\Rightarrow -\frac{x^2}{49}+\frac{y^2}{16}=1$

It is a conjugate hyperbola with $a=7$ & $b=4$

(1) $e=\sqrt{1+\frac{a^2}{b^2}}=\sqrt{1+\frac{49}{16}}=\sqrt{\frac{65}{16}}=\frac{\sqrt{65}}{4}$

(2) foci $=$ ~~(±ae, 0)~~ $=(0,\pm be)=(0,\pm\sqrt{65})$

(3) vertices $=(0,\pm b)=(0,\pm 4)$

(4) LR $=\frac{2a^2}{b}=\frac{2(49)}{4}=\frac{49}{2}$ Ans

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Ans 3 → ELLIPSE

Given: vertices $(0, \pm 13)$ & foci $(0, \pm 5)$

comparing vertices with $(0, \pm b)$ & foci with $(0, \pm be)$

we have $\boxed{b = 13}$ & $\boxed{be = 5}$

Now, $e = \sqrt{1 - \frac{a^2}{b^2}}$

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

$\Rightarrow 5 = \sqrt{169 - a^2}$

$\Rightarrow 25 = 169 - a^2$

$\Rightarrow \boxed{a^2 = 144}$

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

$\Rightarrow \frac{x^2}{144} + \frac{y^2}{169} = 1$ Ans

Ans. 4 → ELLIPSE

Given length of Major Axis $= 26$ & foci $(\pm 5, 0)$

Comparing Major axis with $2a$ & foci with $(\pm ae, 0)$

we have $2a = 26$ and $ae = 5$

$\Rightarrow \boxed{a = 13}$ & $\boxed{ae = 5}$

Now, $e = \sqrt{1 - \frac{b^2}{a^2}}$

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

$\Rightarrow 5 = \sqrt{169 - b^2}$

$25 = 169 - b^2$

$\boxed{b^2 = 144}$

$\therefore$ equation of ellipse is

$\frac{x^2}{169} + \frac{y^2}{144} = 1$ Ans

Qn:- 5 → HYPERBOLA

given vertices $(\pm 2, 0)$ & foci $(\pm 3, 0)$

Comp. vertices with $(\pm a, 0)$ & foci with $(\pm ae, 0)$

we have $\boxed{a = 2}$ & $\boxed{ae = 3}$

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

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

$\Rightarrow 3 = \sqrt{4 + b^2}$

$\Rightarrow 9 = 4 + b^2$

$\Rightarrow \boxed{b^2 = 5}$

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

$\Rightarrow \frac{x^2}{4} - \frac{y^2}{5} = 1$ Ans

Qn. 6 → HYPERBOLA

given foci $(\pm 5, 0)$ & length of transverse axis = 8

Comp. foci with $(\pm ae, 0)$ & transverse axis with $2a$

we have $\boxed{ae = 5}$ and $2a = 8$

$\Rightarrow \boxed{a = 4}$

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

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

$\Rightarrow 5 = \sqrt{16 + b^2}$

$\Rightarrow 25 = 16 + b^2$

$\Rightarrow \boxed{b^2 = 9}$

Equation of hyperbola is

$\frac{x^2}{16} - \frac{y^2}{9} = 1$ Ans

Ques 7 → HYPERBOLA

Given: foci $(\pm 3\sqrt{5}, 0)$ & $LR = 8$

Comparing foci ~~with~~ $(\pm 3\sqrt{5}, 0)$ with $(\pm ae, 0)$

& LR with $\frac{2b^2}{a}$

we have

$$\boxed{ae = 3\sqrt{5}} \quad \& \quad \frac{2b^2}{a} = 8$$

$$\Rightarrow \boxed{b^2 = 4a}$$

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

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

$\Rightarrow 3\sqrt{5} = \sqrt{a^2 + 4a}$

Squaring $45 = a^2 + 4a$

$\Rightarrow a^2 + 4a - 45 = 0$

$\Rightarrow (a+9)(a-5) = 0$

$a = -9$, $a = 5$

$a = -9$: $b^2 = 4a$, $b^2 = -36$ (Not possible)

$a = 5$: $b^2 = 4a$, $b^2 = 20$

$\therefore$ equation of hyperbola is

$$\frac{x^2}{25} - \frac{y^2}{20} = 1 \quad \text{Ans}$$