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## MATHS

## BOOKS - S CHAND MATHS (ENGLISH)

## HYPERBOLA

## Solved Examples

1. Find the equation of the hyperbola whose focus
is $(1,2)$, directrix $2 x+y=1$ and eccentricity
$\sqrt{3}$.
2. Find the axes, vertices, foci, eccentricity, equations of the directrices, and length of the latus rectum of the hyperbola
$9 x^{2}-16 y^{2}=144$.

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3. Find the axes, vertices , foci , exentricity, equations of the directrices and length of the latus rectum of the hyperbola $5 y^{2}-9 x^{2}=36$.
4. Find the equation of the hyperbola whose centre is $(-4,1)$, vertex $(2,1)$, and semiconjugate axis equal to 4.

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5. Find the equation of the hyperbola whose
(i) foci are $( \pm 3,0)$ and vertices $( \pm 2,0)$
(ii) foci are $(0, \pm 8)$ and vertices $(0, \pm 5)$.
6. Find the equation of the hyperbola whose foci are $( \pm 3, \sqrt{5}, 0)$ and latus rectum is of length 8.

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7. Find the equation of the hyperbola whose foci, are $(0, \pm \sqrt{10})$ and which passes through (2,3).

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8. Find the equation of the hyperbola whose foci
are $(8,3),(0,3)$ and eccentricity $=\frac{4}{3}$.

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9. If eande' the eccentricities of a hyperbola and
its conjugate, prove that $\frac{1}{e^{2}}+\frac{1}{e^{2}}=1$.

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10. Prove that the locus of the point of intersection of the lines
$\sqrt{3} x-y-4 \sqrt{3} k=$
0 and $\sqrt{3} k x+k y-4 \sqrt{3}=0$,
for different values of $k$, is a hyperbola whose eccentricity is 2.
11. $A(-1,0)$ and $B(2,0)$ are two given points.

A point $M$ is moving in such a way that the angle $B$ in the triangle AMB remains twice as large as the angle $A$. Show that the locus of the point $M$ is a hyperbola. Fnd the eccentricity of the hyperbola.
12. Find the values of $k$, if the equation
$8 x^{2}-16 x y+k y^{2}-22 x+34 y=12$
respresents an ellipse.

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13. Find the equation of the tangent to the parabola $y^{2}=12 x$ which makes an anlge of $60^{\circ}$ with the $x$-axis.
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14. Prove that the locus of the foot of the perpendicular drawn from the focus of the parabola $y^{2}=4 a x$ upon any tangent to its is the tangent at the vertex.

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15. Fnd the equation of the tangent to the ellipse $\frac{x^{2}}{16}+\frac{y^{2}}{9}=1$ which makes an angle of $30^{\circ}$ with the x -axis.
16. Find the equation of the tangents of the hyperbola $4 x^{2}-9 y^{2}=36$, which are parallel to the line $5 x-3 y=2$.

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17. Prove that the straight line $5 x+12 y=9$ touches the hyperbola $x^{2}-9 y^{2}=9$ and find the point of contact.
18. Find the equation of the hyperbola whose focus
is $(1,1)$ directrix $2 x+2 y=1$, and eccentricity
$\sqrt{2}$.

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2. Find the equation to the hyperbola whose eccentiricity is 2 , whose focus is $(2,0)$ and whose directrix is $x-y=0$.
3. Find equation of the ellipse whose focus is $(1,-1)$, then directrix the line $x-y-3=0$ and eccentricity $\frac{1}{2}$ is

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4. Find the equation of the hypeerbola whose axes are along the coordinate axes and which passes through $(-3,4)$, and $(5,6)$

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5. Find the eccentricity of the hyperbola whose equation is $2 x^{2}-3 y^{2}=15$.

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6. Find the eccentricity and coordinates of the foci of the curve $3 x^{2}-y^{2}=4$.

## (D) Watch Video Solution

7. Find the coordinate of the foci, coordinate of
the vertices, eccentricity and the length of the
latus rectum of the hyperbola
$16 x^{2}-9 y^{2}=576$

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8. Find the coordinate of the foci, vertice eccentricity and the length of the latus rectum of the hyperbola
$\frac{y^{2}}{9}-\frac{x^{2}}{27}=1$
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9. Find the coordinate of the foci, vertices, eccentricity and the length of the latus rectum of the hyperbola $9 y^{2}-4 x^{2}=36$

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10. Find the coordinate of the foci, vertice eccentricity and the length of the latus rectum of the hyperbola
$49 y^{2}-16 x^{2}=784$
11. In the hyperbola $x^{2}-y^{2}=4$, find the length of the axes, the coordinates of the foci, the ecentricity, and the latus rectum, and the equations of the directrices.

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12. Find (a) the eccentricities, (b) the co-ordinates
of the foci (c )the equations of the directricies of
the following hyperbolas
(i) $\frac{(x-1)^{2}}{9}-\frac{y^{2}}{4}=1$
(ii) $\frac{(x+1)^{2}}{64}-\frac{(y-2)^{2}}{36}=1$.

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13. Find the equation of the hyperbola, referred to its axes as the axes of coordinates,

Whose transverse and conjugate axes in length respectively 2 and 3 ,
14. Find the equation of the hyperbola, referred to its axes as the axes of coordinates,
whose foci are $(2,0)$ and ( $-2,0$ ) and eccentricity equal to $\frac{3}{2}$,

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15. Find the equation of the hyperbola, referred to its axes as the axes of coordinates,
the distance between whose foci is 4 and whose eccentricity is $\sqrt{2}$,
16. Find the equation of the hyperbola, referred to its axes as the axes of coordinates,
'whose conjugate axis is 3 and the distance between whose foci is 5 ,

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## Exercise 25 B

1. Find the tangent to the $y^{2}=16 x$, making of $45^{\circ}$ with the $x$-axis.
2. A tangent to the parabola $y^{2}=16 x$ makes an angle of $60^{\circ}$ with the $x$-axis. Find its point of contact.

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3. Find the equations of the tangents to the parabola $y^{2}=6 x$ which pass through the point $\left(\frac{3}{2}, 5\right)$.
4. Find the equations of the tangents of the parabola $y^{2}+12 x=0$ from the point $(3,8)$

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5. Show that the line $12 y-20 x-9=0$ touches
the parabola $y^{2}=5 x$.
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6. Show that the line $x+y=1$ touches the parabola $y=x-x^{2}$.

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7. Show that the line $x+n y+a n^{2}=0$ touches
the parabola $y^{2}=4 a x$ and find the point of contact.

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8. Find the tangents to the ellipse $x^{2}+9 y^{2}=3$,
which are (i) parallel (ii) perpendicular to the line $3 x+4 y=9$.

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9. Find the equations of the tanggents to the
ellipse $\frac{x^{2}}{2}+\frac{y^{2}}{7}=1$ that make an angle of $45^{\circ}$ with the $x$-axis.

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10. Find the equation of the tangents of the ellipse $\frac{x^{2}}{16}+\frac{y^{2}}{9}=1$, which make equal intercepts on the axes.

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11. Find the value of ' c ' so that $2 x-y+c=0$ may touch the ellipse $x^{2}+y^{2}=2$.

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12. Show that the line $l x+m y=1$ will touch the
ellipse $\frac{x^{2}}{a^{2}}+\frac{y^{2}}{b^{2}}=1$ if $a^{2} l^{2}+b^{2} m^{2}=1$.

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13. Show that the line are tangent to the given
hyperbolas and dectermine the points of contact.
$x+1=0,4 x^{2}-3 y^{2}=4$
(D) Watch Video Solution
14. Show that the line are tangent to the given hyperbolas and determine the points of contact.
$x-2 y+1=0, x^{2}-6 y^{2}=3$

## (D) Watch Video Solution

15. Find the equations of the tangents to the hyperbola $\quad \frac{x^{2}}{a^{2}}-\frac{y^{2}}{b^{2}}=1 \quad$ are mutually perpendicular, show that the locus of $P$ is the circle $x^{2}+y^{2}=a^{2}-b^{2}$.

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16. Show that the straight line $x+y=1$ touches
the hyperbola $2 x^{2}-3 y^{2}=6$. Also find the coordinates of the point of contact.

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17. Find the equations of the tangents to the hyperbla $\quad 4 x^{2}-9 y^{2}=144, \quad$ which are perpendicular to the line $6 x+5 y=21$.

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1. Find the eccentricity and the coordinate of foci of the hyperbola $25 x^{2}-9 y^{2}=225$.

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2. Find the value(s) of $k$ so that the line $2 x+y+k=0$ may touch the hyperbola $3 x^{2}-y^{2}=3$
3. From the following information, find the equation of the hyperbola. Focus $(-2,1)$,
Directrix: $2 x-3 y+1=0, e=\frac{2}{\sqrt{3}}$

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4. Find the equation of the hyperbola whose centre is at the origin, transverse axis along x axis, eccentricity is $\sqrt{5}$ and the sum of whose semi-axes is 9 .
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5. Find the equation of the hyperbola whose foci are $(4,1),(8,1)$ and whose eccentricity is 2 .

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6. Show that the line $y=x+\sqrt{7}$ touches the hyperbola $9 x^{2}-16 y^{2}=144$.

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7. Find the equation of the hyperbola whose foci are $(0, \pm 13)$ and the length of the conjugate

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8. Find the equation of the hyperbola whose transverse and conjugate axes are the $x$ and $y$ axes respectively, given that the length of conjugate axis is 5 and distance between the foci is 13.

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9. Find the equation the conic whose focus is
$(1,-1)$ eccentricity is $\frac{1}{2}$ and the directrix is the line $x-y=3$. Is the conic section an ellipse?
