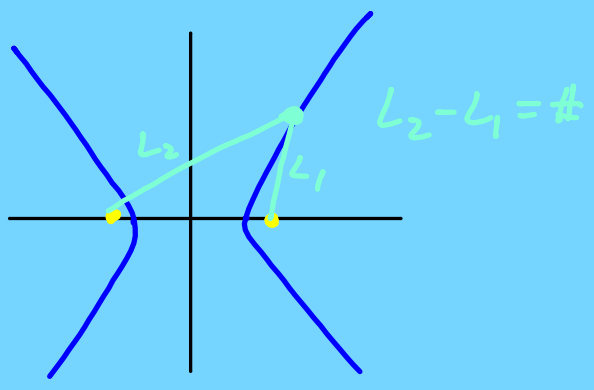
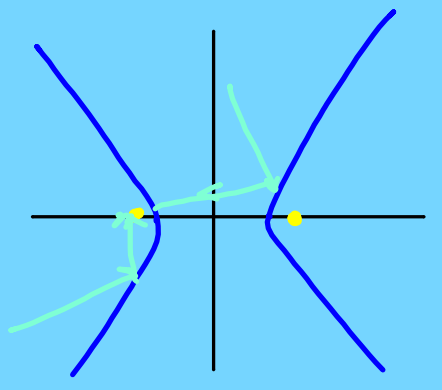
November 18, 2022

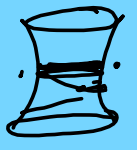
HYPERBOLAS

the set of points in which the difference of the distances from two given points is constant



Reflective Property





Applications

telescope | microscope mirrors
path of comet
Architecture
Light from lampshade
transmission
Sonic boom
nuclear cooling towers

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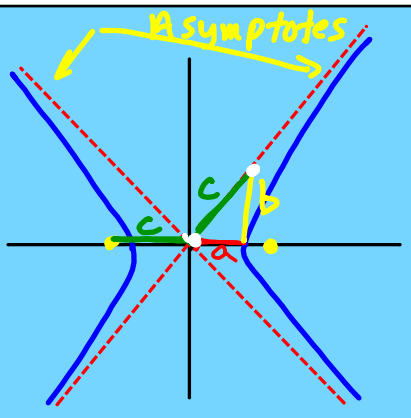

$$\frac{(x-h)^2}{a^2} - \frac{(y-K)^2}{b^2} = 1$$

Foci: $(h \pm c, K)$

Vertices: $(h \pm a, K)$

Slopes: $\pm \frac{b}{a}$

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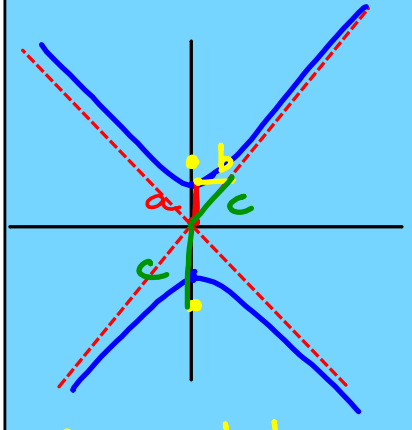
a = center to vertex

b = vertex to asymptote

c = center to focus

$c^2 = a^2 + b^2$

a is the 1st number.



$$\frac{(y-K)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$$

Foci: $(h, K \pm c)$

Vertices: $(h, K \pm a)$

Slopes: $\pm \frac{a}{b}$

Asymptotes — form boundary for the curve as it extends to ∞

$25y^2 - 16x^2 - 150y - 32x - 191 = 0$

$25y^2 - 150y \qquad -16x^2 - 32x \qquad = 191$

$25(y^2 - 6y + 9) - 16(x^2 + 2x + 1) = 191$

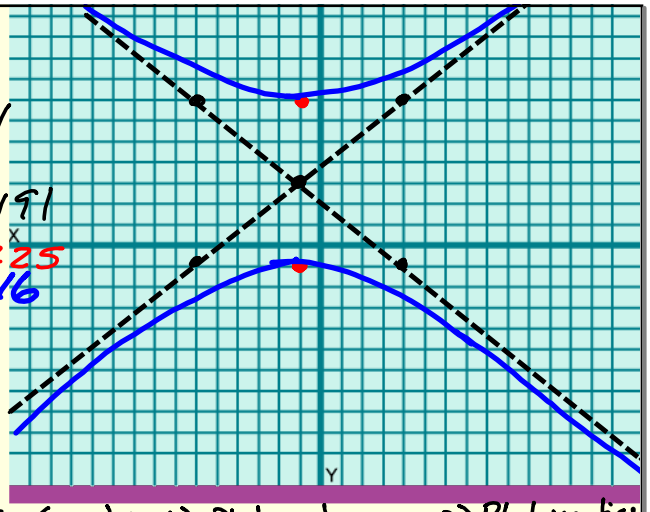
$-3 \qquad +1$

$+225 \qquad -16$

$\frac{25(y-3)^2}{400} - \frac{16(x+1)^2}{400} = \frac{400}{400}$

$16 \qquad 25$

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



To Graph: 1) Plot center 2) Plot asymptotes 3) Plot vertices using a 4) Draw curves.

Center: $(-1, 3)$

$a = \sqrt{16} = 4$

$b = \sqrt{25} = 5$

Vertical (y's are firs)

Slopes: $\pm \frac{a}{b}$ $\pm \frac{4}{5}$

Foci: $(h, K \pm c)$

$c^2 = a^2 + b^2$

$c^2 \quad 16 + 25$

$\sqrt{c^2} = \sqrt{41}$

$(-1, 3 \pm \sqrt{41})$

Vertices $(h, K \pm a)$

$(-1, 3 \pm 4)$

OR

$(-1, 7) \quad (-1, -1)$