HYPERBOLAS
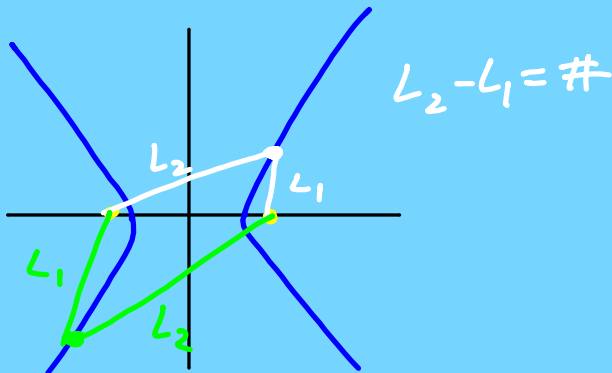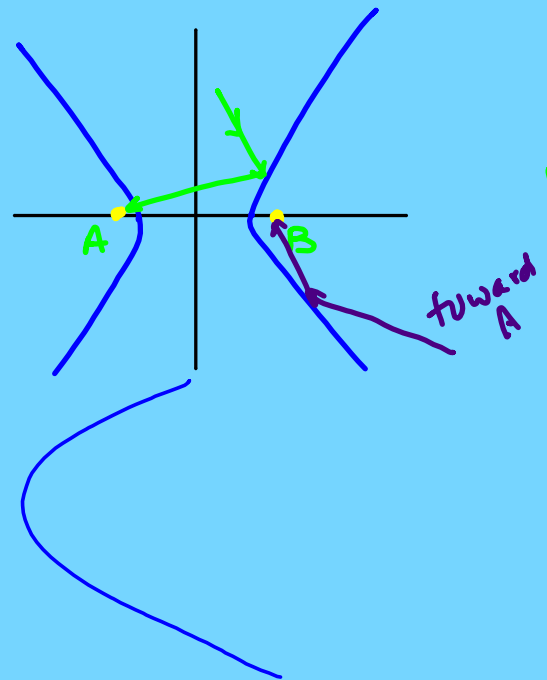
— the set of points in which the **difference** of the distances from two given points (foci) is constant.

$$L_2 - L_1 = \#$$

L_2 L_1

L_1 L_2

Reflective Property

A   B

toward A

Applications

lamp shade
Architecture
Gears
Cooling Towers
Path of comets

asymptotes

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

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

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

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

a = center to vertex
b = vertex to asymptote
c = center to focus

$a^2 + b^2 = c^2$
a is the 1st #

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

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

Foci $(h, K \pm c)$
Vertices $(h, K \pm a)$

To graph:
1) Plot center
2) Plot asymptotes using slopes
3) Plot vertices using a
4) Draw curves toward asymptotes

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

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

$$25(y^2 - 6y + 9) - 16(x^2 + 2x + 1) = 191$$
$$\quad -3 \qquad\qquad +1 \qquad +225$$
$$\qquad\qquad\qquad\qquad\qquad -16$$

$$+225 \qquad\qquad -16$$

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

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

Center: $(-1, 3)$
$a = \sqrt{16} = 4$
$b = \sqrt{25} = 5$
Vertical (y first)

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