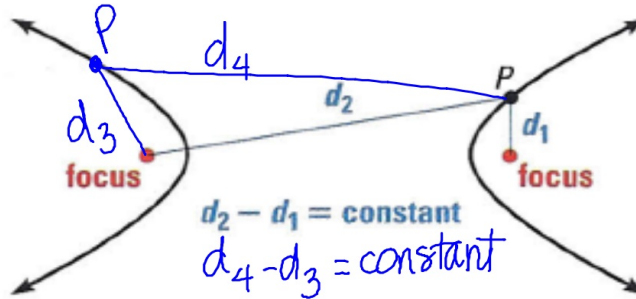


10.5
Hyperbolas

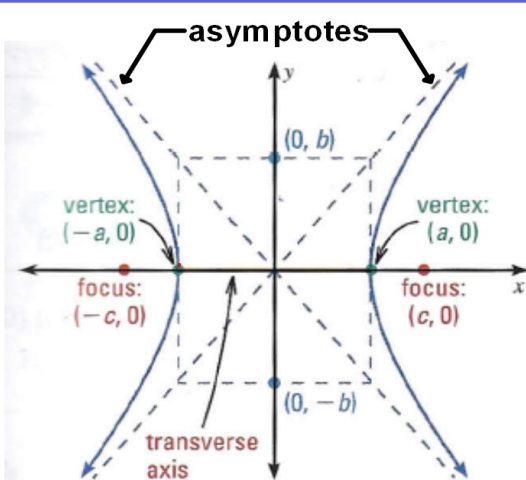
A **hyperbola** is the set of all points P in a plane such that the difference of the distances from P to 2 fixed points (**foci**) is constant.



p615



A hyperbola has 2 branches.

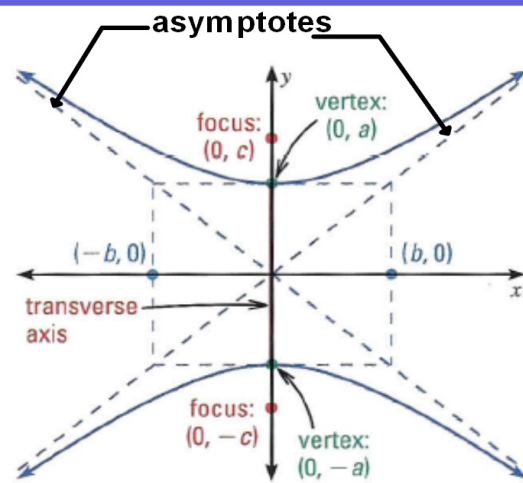


Hyperbola with horizontal transverse axis

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

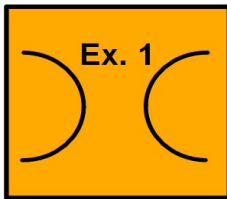
$$c^2 = a^2 + b^2$$

center (0, 0)



Hyperbola with vertical transverse axis

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



Graph $81x^2 - 9y^2 = 729$

$$\frac{x^2}{9} - \frac{y^2}{81} = 1$$

center: $(0, 0)$

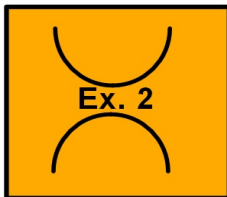
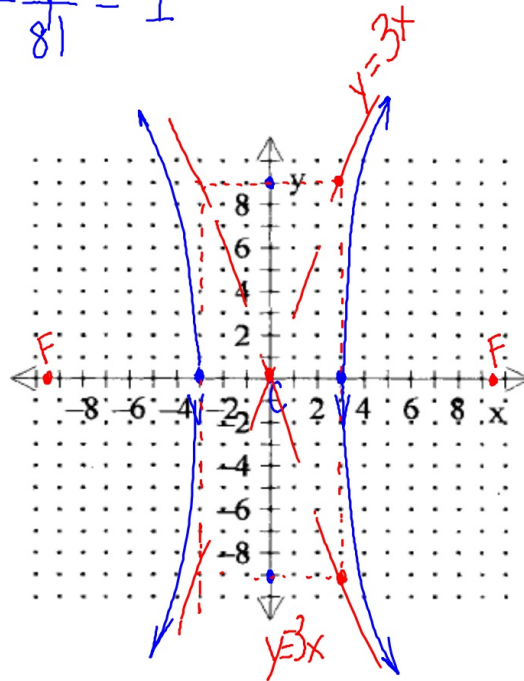
vertices: $(\pm 3, 0)$

foci: $(\pm 3\sqrt{10}, 0)$

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

$$\sqrt{c^2} = \sqrt{90} = \pm 3\sqrt{10}$$

asymptotes: $y = 3x, y = -3x$



Graph $4(y - 1)^2 - 16(x + 2)^2 = 64$

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

center: $(-2, 1)$

vertices: $(-2, 5), (-2, -3)$

foci: $(-2, 1+2\sqrt{5}), (-2, 1-2\sqrt{5})$

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

$$\sqrt{c^2} = \sqrt{20} = \pm 2\sqrt{5}$$

asymptotes: $y = -2x - 3$
 $y = 2x + 5$

