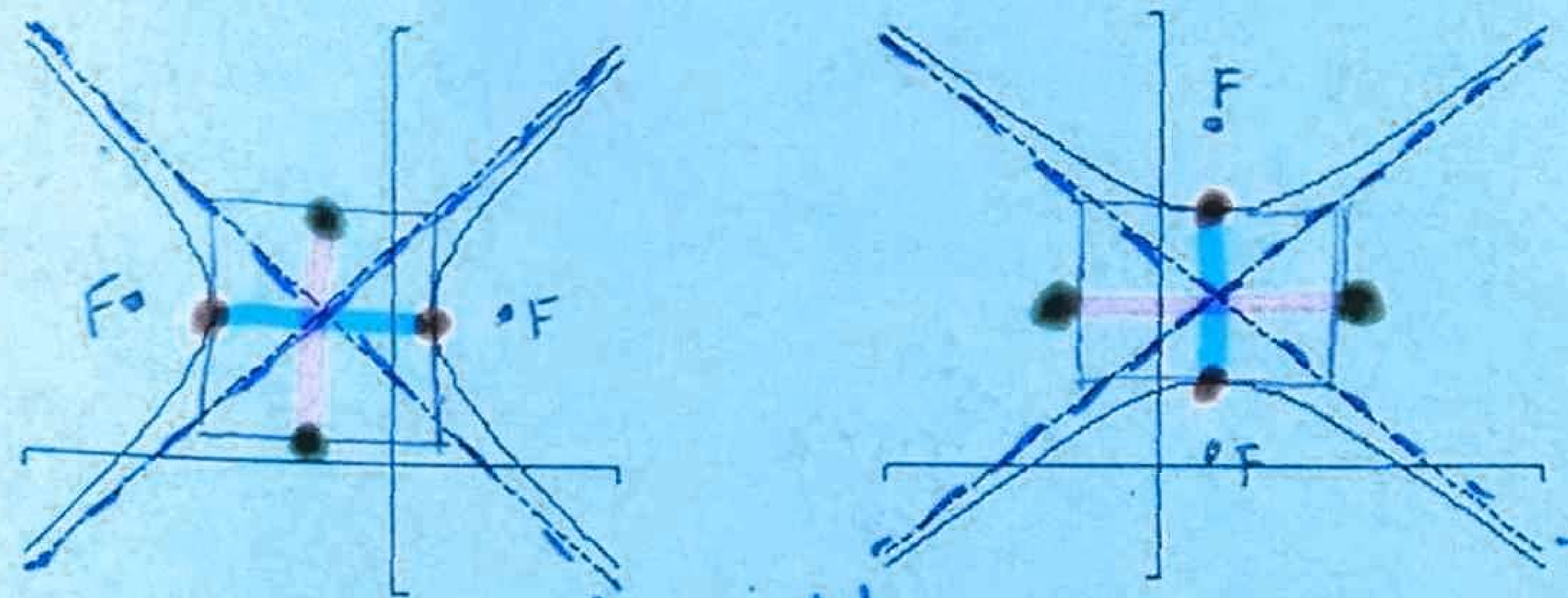
HYPERBOLAS



Asymptotes

VERTICES: endpoints of the transverse axis "a"

CO - VERTICES: end points of the conjugate axis "b"

FOCUS/ FOCI: two fixed points locates inside each branch of a hyperbola "f"

TRANSVERSE AXIS OF SYMMETRY: contains the vertices. The equation of a hyperbola depends on whether the transverse axis is horizontal or vertical.

CONJUGATE AXIS OF SYMMETRY: separates the two branches of the hyperbola and contains the co - vertices

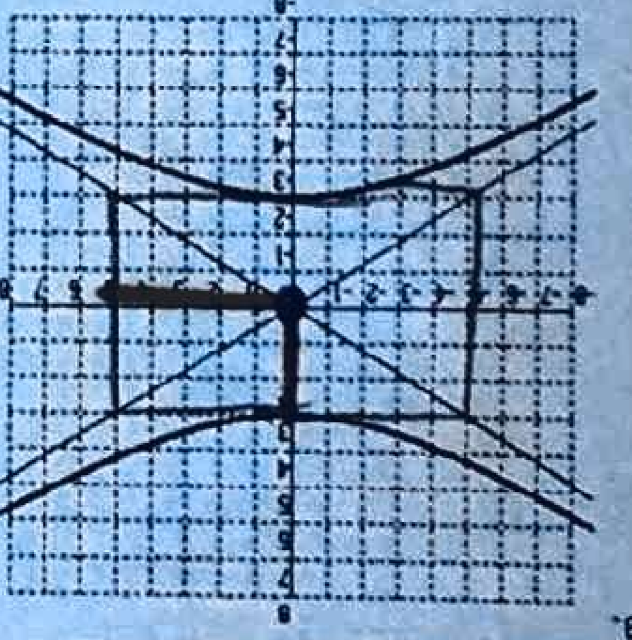
(h,k)

$a =$ direction opens?

$b =$

Write the equation of a hyperbola in Standard Form

a.



$(h,k)=(0,0)$

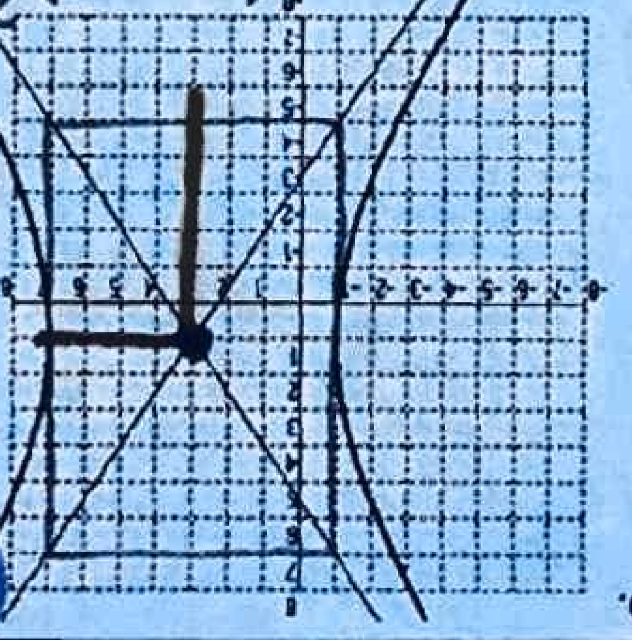
$a=3$

$b=5$

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

$$\frac{y^2}{9}-\frac{x^2}{25}=1$$

b.



$(h,k)=(3,1)$

$a=4$

$b=6$

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

$$\frac{(x-3)^2}{16}-\frac{(y-1)^2}{36}=1$$

Write an equation in standard form for each hyperbola with center at (0,0)

a. center (0,0), vertex (0,12), and focus (0,20)

$f=20$ $a=12$

$f^2=a^2+b^2$

$20^2=12^2+b^2$

$400=144+b^2$

$256=b^2$

$b=16$

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

$$\boxed{\frac{y^2}{144}-\frac{x^2}{256}=1}$$

b. center (0,0), vertex (0,9), and co-vertex (7,0)

$b=7$ $a=9$

$$\frac{y^2}{81}-\frac{x^2}{49}=1$$

c. center (0,0), vertex (8,0), and focus (10,0)

$f=10$ $a=8$

$f^2=a^2+b^2$

$100=64+b^2$

$b^2=36$

$b=6$

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

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

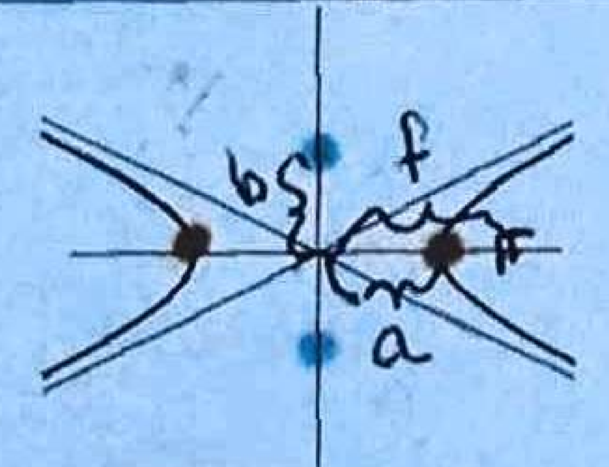
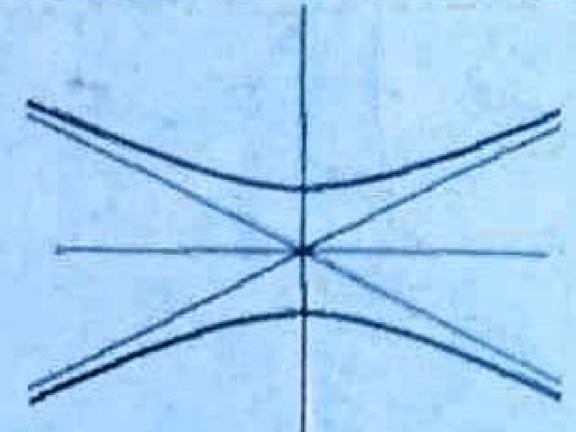
d. center (0,0), vertex (4,0), and co-vertex (0,10)

$b=10$ $a=4$

$$\frac{x^2}{16}-\frac{y^2}{100}=1$$

GLUE HERE

Standard Form of a Hyperbola with Center at (0, 0)

Major Axis	Horizontal	Vertical
Equation	$\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$	$\frac{y^2}{a^2}-\frac{x^2}{b^2}=1$
[redacted]	$(a,0)$ and $(-a,0)$	$(0,a)$ and $(0,-a)$
Foci	$(f,0)$ and $(-f,0)$	$(0,f)$ and $(0,-f)$
Co – Vertices	$(0,b)$ and $(0,-b)$	$(b,0)$ and $(-b,0)$
Asymptotes	$y=\pm\frac{b}{a}x$	$y=\pm\frac{a}{b}x$
Graph		

The values of a, b, and f are related by the equation $f^2 = a^2 + b^2$.
The length of the TRANSVERSE axis is $2a$, and length of the CONJUGATE axis is $2b$.

Graph each Hyperbola. Find the Foci and asymptotes as well ☺

a. $\frac{x^2}{9}-\frac{y^2}{4}=1$)(

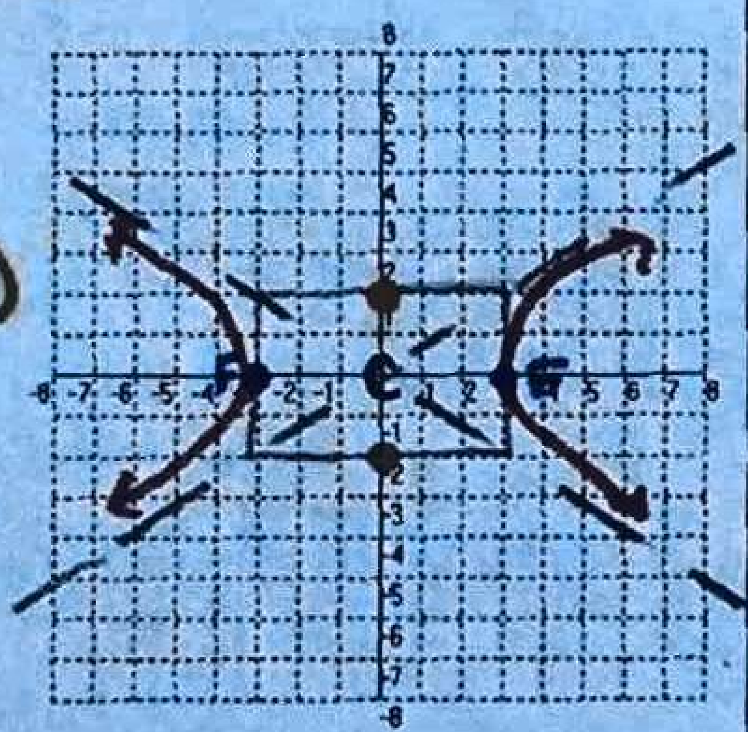
$a=3$ $b=2$

Vertices:
$(3,0)\ (-3,0)$

Co-Vertices:
$(0,2)\ (0,-2)$

Foci:
$(\pm 3.6, 0)$

Asymptotes:
$y=\pm\frac{2}{3}x$



$f^2=a^2+b^2$
$=9+4$
$=13$ $f=\sqrt{13}$
$\approx \pm 3.6$

b. $\frac{36y^2}{900}-\frac{25x^2}{900}=\frac{900}{900}$ •$a=5$

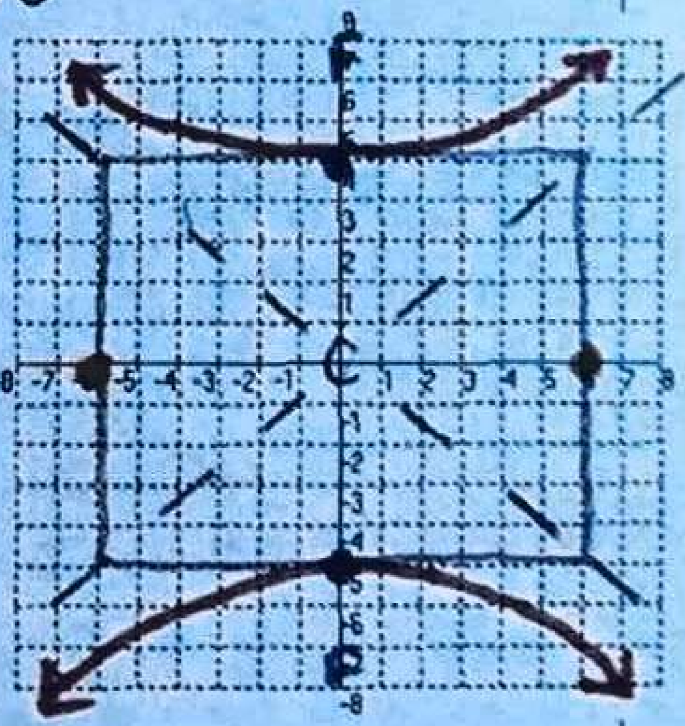
$\frac{y^2}{25}-\frac{x^2}{36}=1$ •$b=6$

Vertices:
$(0,5)\ (0,-5)$

Co-Vertices:
$(6,0)\ (-6,0)$

Foci:
$(0,\pm 7.8)$

Asymptotes:
$y=\pm\frac{5}{6}x$



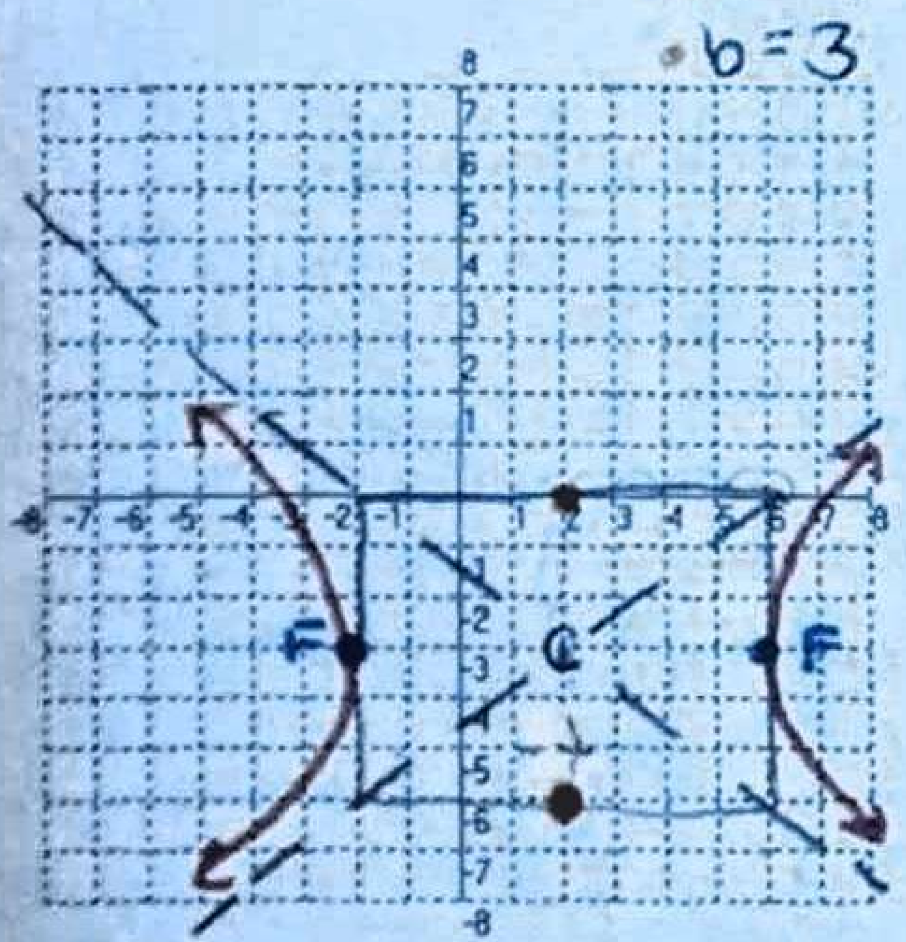
$f^2=a^2+b^2$
$25+36$
$f^2=61$ $f\approx 7.8$

Standard Form of a Hyperbola with Center at (h, k)

Major Axis	Horizontal	Vertical
Equation	$\frac{(x-h)^2}{a^2}-\frac{(y-k)^2}{b^2}=1$	$\frac{(y-k)^2}{a^2}-\frac{(x-h)^2}{b^2}=1$
Asymptotes	$y=\pm\frac{b}{a}(x-h)+k$	$y=\pm\frac{a}{b}(x-h)+k$

Graph each Hyperbola and find the foci and asymptotes.

a. $\frac{(x-2)^2}{16}-\frac{(y+3)^2}{9}=1$ Center $(2,-3)$
•$a=4$
•$b=3$



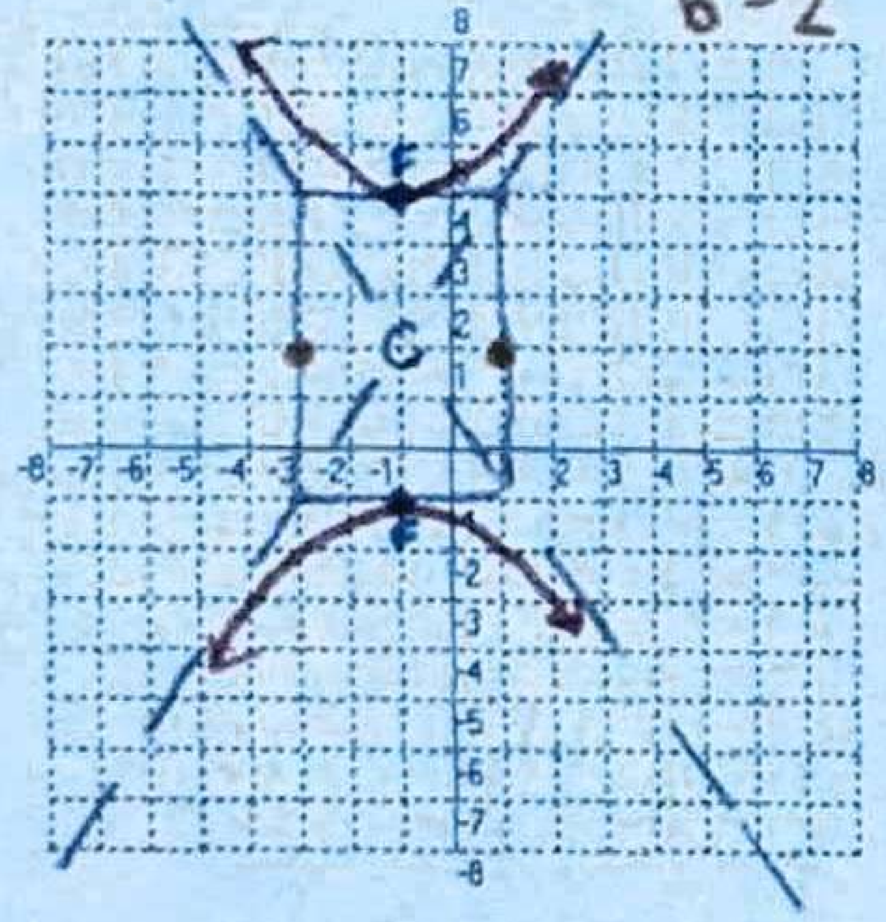
Vertices: $(6,-3)$ & $(-2,-3)$

Co-Vertices: $(2,0)$ & $(2,-6)$

Foci: $(7,-3)$ & $(-3,-3)$
± 5

Asymptotes: $y=\pm\frac{3}{4}(x-2)-3$
$y=\pm\frac{b}{a}(x-h)+k$

b. $\frac{(y-2)^2}{9}-\frac{(x+1)^2}{4}=1$ Center $(-1,2)$
$a=3$
$b=2$



Vertices: $(-1,5)$ & $(-1,-1)$

Co-Vertices: $(1,2)$ & $(-3,2)$

Foci: $(-1,-1.6)$ & $(-1,5.6)$
± 3.6

Asymptotes: $y=\pm\frac{3}{2}(x+1)+2$
$y=\pm\frac{a}{b}(x-h)+k$