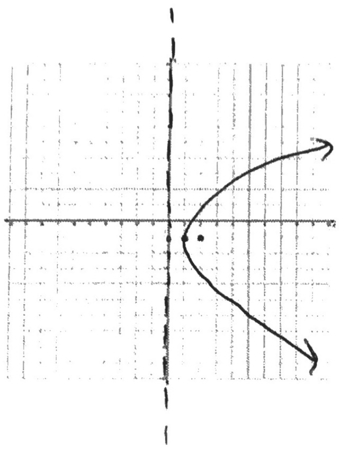
Day 4

Thursday, November 30, 2017
8:28 AM

Warm-Up

Parabola $3y^2 + 6y + 15 = 12x$

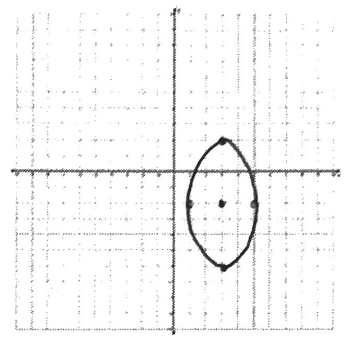


$3y^2+6y=12x-15$
$3(y^2+2y)=12x-15$
$3(y+1)^2=12x-15+3(1)$
$3(y+1)^2=12x-12$
$3(y+1)^2=12(x-1)$
$(y+1)^2=4(x-1)$

$4p=4$
$p=1$

vertex: $(1,-1)$
focus: $(2,-1)$
directrix: $x=0$

Ellipse/Circle $4x^2 + y^2 - 24x + 4y + 24 = 0$



$4(x^2-6x)+y^2+4y=-24$
$4(x-3)^2+(y+2)^2=-24+4(9)+4$
$4(x-3)^2+(y+2)^2=16$
$\frac{(x-3)^2}{4}+\frac{(y+2)^2}{16}=1$

$a^2=16$
$b^2=4$

center: $(3,-2)$
vertices: $(3,2),(3,-6)$
co-vertices: $(1,-2),(5,-2)$

HW Questions?

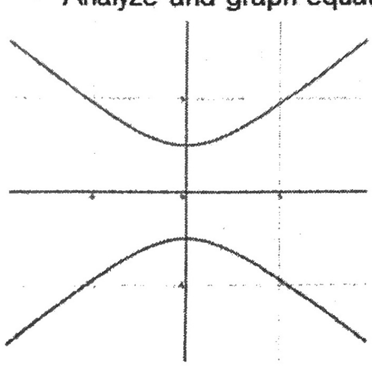
QUIZ TIME

Then

You analyzed and graphed ellipses and circles. (Lesson 7-2)

Now

- Analyze and graph equations of hyperbolas.



EXAMPLE 1 **Graph Hyperbolas in Standard Form**

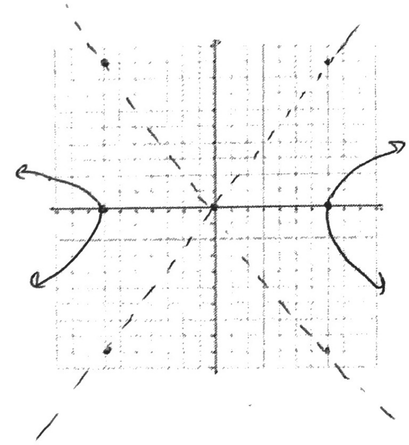
A. Graph the hyperbola given by $\frac{x^2}{49}-\frac{y^2}{81}=1$.

horizontal $\frac{x^2}{49}_{a^2} - \frac{y^2}{81}_{b^2} = 1$

* for hyperbolas, a^2 is always the first denominator.
* whichever variable comes first, tells you the direction of the hyperbola.

x first: horizontal

y first: vertical



center: $(0,0)$ $a=7,\ b=9,\ c=\sqrt{49+81}=\sqrt{130}$

* $c=\sqrt{a^2 + b^2}$

vertices: $(0+7,0),\ (0-7,0)$

$(7,0),\ (-7,0)$

asymptotes: $y-0=\pm\frac{9}{7}(x-0)$ $\pm\frac{b}{a}$

foci: $(0+\sqrt{130},0),\ (0-\sqrt{130},0)$

$(\sqrt{130},0),\ (-\sqrt{130},0)$

EXAMPLE 1 **Graph Hyperbolas in Standard Form**

B. Graph the hyperbola given by

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

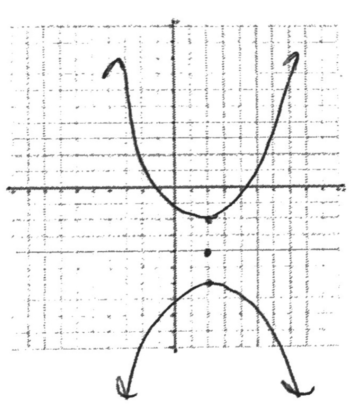
a^2 4, b^2 9

center: $(2,-4)$ $a=2,\ b=3,\ c=\sqrt{13}$

vertices: $(2,-6),\ (2,-2)$

foci: $(2,-4+\sqrt{13}),\ (2,-4-\sqrt{13})$

asymptotes: $y+4=\pm\frac{2}{3}(x-2)$ a/b



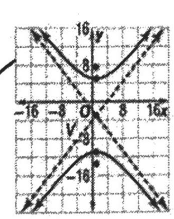
center: $(-1,3)$ $a=8,\ b=7$

vertices: $(-1,11),\ (-1,-5)$

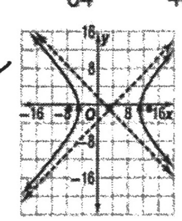
EXAMPLE 1 **Guided Practice**

Graph the hyperbola given by $\frac{(y-3)^2}{64} - \frac{(x+1)^2}{49} = 1$.

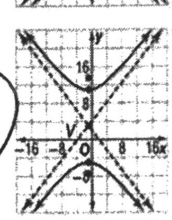
A.



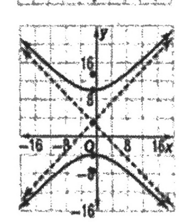
B.



C.

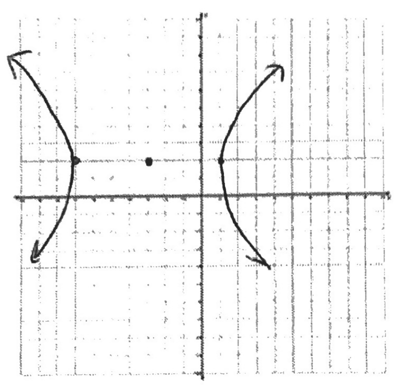


D.



EXAMPLE 2 Graph a Hyperbola

Graph the hyperbola given by $4x^2 - y^2 + 24x + 4y = 28$.



$4x^2+24x - y^2+4y = 28$

$4(x^2+6x)-(y^2-4y)=28$

$4(x+3)^2-(y-2)^2 = 28+4(9)+(-1)(4)$

$4(x+3)^2-(y-2)^2=64$

$\frac{(x+3)^2}{16} - \frac{(y-2)^2}{64} = 1$

$a=4$

$b=8$

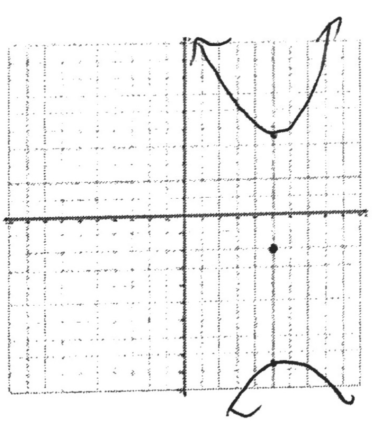
$c=\sqrt{80}=4\sqrt{5}$

center: $(-3,2)$

vertices: $(1,2),(-7,2)$

EXAMPLE 2 Guided Practice

Graph the hyperbola given by $3x^2 - y^2 - 30x - 4y = -119$.



$3x^2-30x - y^2-4y = -119$

$3(x^2-10x)-(y^2+4y)=-119$

$3(x-5)^2-(y+2)^2 = -119+3(25)+(-1)(4)$

$3(x-5)^2-(y+2)^2=-48$

$\frac{-(x-5)^2}{16} + \frac{(y+2)^2}{48} = 1$

$\frac{(y+2)^2}{48} - \frac{(x-5)^2}{16} = 1$

$a=\sqrt{48}=4\sqrt{3}$

center: $(5,-2)$

vertices: $(5,-2+4\sqrt{3}),(5,-2-4\sqrt{3})$

$(5,4.928);(5,-8.928)$