NAME ______________________ DATE ____________ PERIOD ____________

7-3 Study Guide and Intervention *(continued)*

Hyperbolas

Identify Conic Sections You can determine the type of conic when the equation for the conic is in general form, $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$. The discriminant, or $B^2 - 4AC$, can be used to identify a conic when the equation is in general form.

Discriminant	Conic Section
less than 0; $B = 0$ and $A = C$	circle
less than 0; $B \neq 0$ or $A \neq C$	ellipse
equal to 0	parabola
greater than 0	hyperbola

Exercises

Use the discriminant to identify each conic section.

1. $4x^2 + 4y^2 - 2x - 9y + 1 = 0$

$0^2 - 4(4)(4) < 0$ circle

2. $10x^2 + 6y^2 - x + 8y + 1 = 0$

$0 - 4(10)(6) < 0$ ellipse

3. $-2x^2 + 6xy + y^2 - 4x - 5y + 2 = 0$

$6^2 - 4(-2)(1) = 36 + 8 > 0$ hyp.

4. $x^2 + 6xy + y^2 - 2x + 1 = 0$

$6^2 - 4(1)(1) > 0$ hyperbola

5. $5x^2 + 2xy + 4y^2 + x + 2y + 17 = 0$

$2^2 - 4(5)(4) < 0$ ellipse

6. $x^2 + 2xy + y^2 + x + 10 = 0$

$2^2 - 4(1)(1) = 0$ parabola

7. $25x^2 + 100x - 54y = -200$

$0^2 - (4)(25)(0) = 0$ parabola

8. $16x^2 + 100x - 54y^2 = -100$

$0 - 4(16)(-54) > 0$

hyperbola

Lesson 7-3

Exercises

Graph the hyperbola given by each equation.

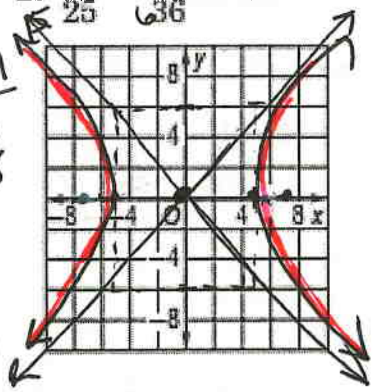
1. $\frac{x^2}{25} - \frac{y^2}{36} = 1$

6

$c^2 = 61$

$c = \sqrt{61}$

≈ 7.8

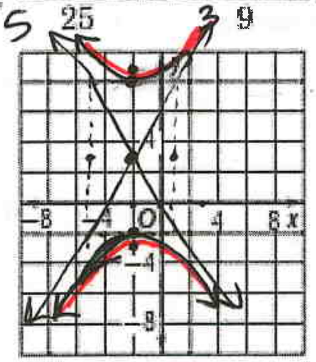


2. $\frac{(y-3)^2}{25} - \frac{(x+2)^2}{9} = 1$

5 3

$c = \sqrt{31}$

≈ 5.6

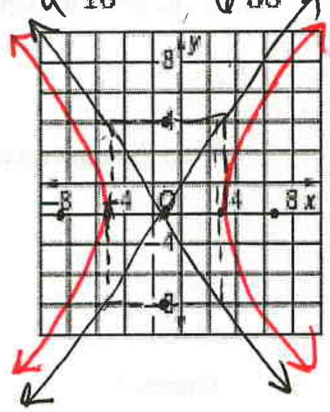


3. $\frac{(x-1)^2}{16} - \frac{(y+2)^2}{36} = 1$

4 6

$c = \sqrt{52}$

$c \approx 7.2$



NAME ______________________________ DATE ____________ PERIOD ____________

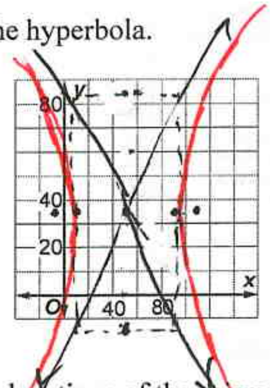
7-3 Word Problem Practice

Hyperbolas

1. EARTHQUAKES The epicenter of an earthquake lies on a branch of the hyperbola represented by $\frac{(x-50)^2}{1600} - \frac{(y-35)^2}{2500} = 1$, where the seismographs are located at the foci.

a=40
b=50
c≈ ≈64
O(50,35)
114
-14

a. Graph the hyperbola.



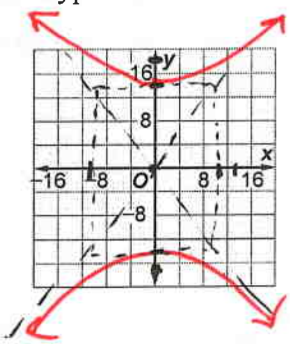
b. Find the locations of the seismographs.

Seismograph locations:
(-14,35) & (114,35)

2. SHADOWS A lamp projects light onto a wall in the shape of a hyperbola. The edge of the light can be modeled by $\frac{y^2}{196} - \frac{x^2}{121} = 1$.

a=14
b=11
c≈17.8

a. Graph the hyperbola.



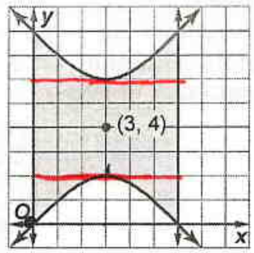
b. Write the equations of the asymptotes.

$y = \frac{\pm 14}{11}x$

c. Find the eccentricity.

$e = \frac{c}{a} \quad \frac{17.8}{14} = 1.27$

3. PARKS A grassy play area is in the shape of a hyperbola, as shown.



(x,y)
(0,0)

h=3
k=4
a=2
b^2=
x=0 y=0
b=

a. Write an equation that models the curved sides of the play area.

$\frac{(y-4)^2}{4} - \frac{(x-3)^2}{b^2} = 1$ | $\frac{(y-4)^2}{4} - \frac{(x-3)^2}{9} = 1$

$\frac{(0-4)^2}{4} - \frac{(-3)^2}{b^2} = 1 \quad 4 - \frac{9}{b^2} = 1 \quad 3 = \frac{9}{b^2} \quad b^2 = 3$

$b = \sqrt{3}$

b. If each unit on the coordinate plane represents 3 feet, what is the narrowest vertical width of the play area?

2a - narrowest point

4 units

$\boxed{12 \text{ feet}}$

4. Use the discriminant to identify each conic section.

a. $-2x^2 + 6xy + y^2 - 4x - 5y + 2 = 0$

$6^2 - 4(-2)(1)$ $36 + 8 > 0$, hyperbola

b. $x^2 + 6xy + y^2 - 2x + 1 = 0$

$6^2 - 4(1)(1)$ $36 - 4 > 0$ hyperbola

c. $5x^2 + 2xy + 4y^2 + x + 2y + 17 = 0$

$2^2 - 4(5)(4) < 0$ ellipse

d. $x^2 + 2xy + y^2 + x + 10 = 0$

$2^2 - 4(1)(1) = 0$ parabola

Lesson 7-3