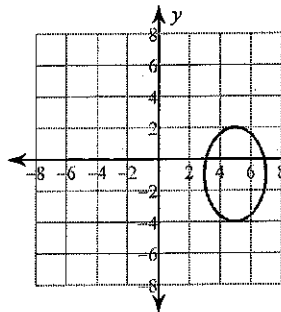


## Answers to Conic Sections Review

1) Center:  $(-6, -13)$   
 Radius:  $\sqrt{33}$

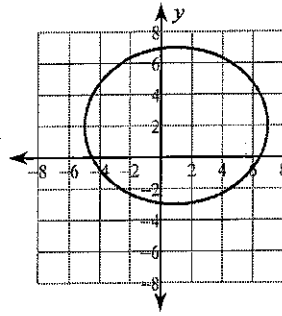
2)  $(x + 5)^2 + (y + 9)^2 = 64$

3)



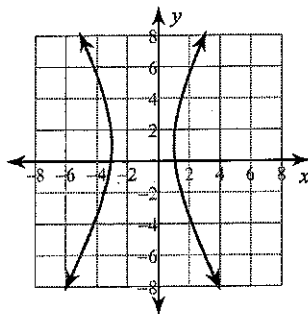
Vertices:  $(5, 2)$   
 $(5, -4)$   
 Co-vertices:  $(7, -1)$   
 $(3, -1)$   
 Foci:  $(5, -1 + \sqrt{5})$   
 $(5, -1 - \sqrt{5})$   
 Major Axis: 6 units  
 Minor Axis: 4 units

4)



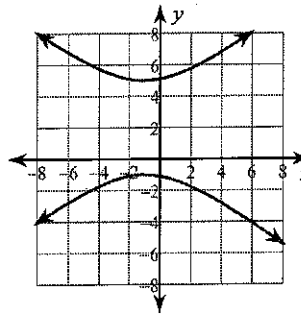
Vertices:  $(7, 2)$   
 $(-5, 2)$   
 Co-vertices:  $(1, 7)$   
 $(1, -3)$   
 Foci:  $(1 + \sqrt{11}, 2)$   
 $(1 - \sqrt{11}, 2)$   
 Major Axis: 12 units  
 Minor Axis: 10 units

5)



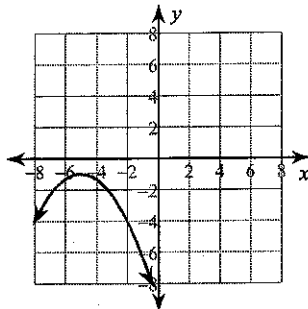
Vertices:  $(1, 1)$   
 $(-3, 1)$   
 Foci:  $(-1 + 2\sqrt{5}, 1)$   
 $(-1 - 2\sqrt{5}, 1)$   
 Opens left/right

6)



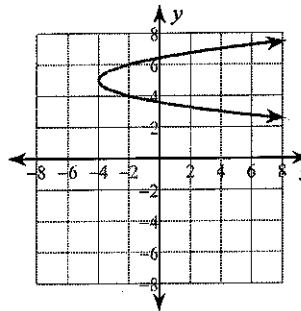
Vertices:  $(-1, 5)$   
 $(-1, -1)$   
 Foci:  $(-1, 7)$   
 $(-1, -3)$   
 Opens up/down

7)



Vertex:  $(-5, -1)$   
 Focus:  $(-5, -\frac{7}{4})$   
 Directrix:  $y = -\frac{1}{4}$   
 Opens: Down

8)



Vertex:  $(-4, 5)$   
 Focus:  $(-\frac{31}{8}, 5)$   
 Directrix:  $x = -\frac{33}{8}$   
 Opens: Right

9)  $\frac{(x-2)^2}{169} + \frac{(y+5)^2}{25} = 1$

10)  $\frac{(x-1)^2}{121} + \frac{(y-6)^2}{225} = 1$

11)  $\frac{(x+8)^2}{100} - \frac{(y-6)^2}{36} = 1$

12)  $\frac{(y+6)^2}{36} - \frac{(x-9)^2}{25} = 1$

13)  $y = 2(x+4)^2 - 7$

14)  $x = 5(y+3)^2 + 2$

15)  $(x+9)^2 + (y-15)^2 = 4$

16)  $\frac{(x-1)^2}{36} + \frac{(y+8)^2}{100} = 1$

17)  $\frac{(y-3)^2}{81} - \frac{(x+1)^2}{36} = 1$

18)  $\frac{(x-1)^2}{4} - \frac{(y+4)^2}{100} = 1$

19)  $y = -5(x+3)^2 - 6$

20)  $y = (x-9)^2 + 10$

Conic Sections Review

Identify the center and radius of each.

1)  $(x + 6)^2 + (y + 13)^2 = 33$

$(-6, -13) \quad r = \sqrt{33}$

Use the information provided to write the standard form equation of each circle.

2) Center:  $(-5, -9)$   
Radius: 8

$(x + 5)^2 + (y + 9)^2 = 64$

Ellipses!

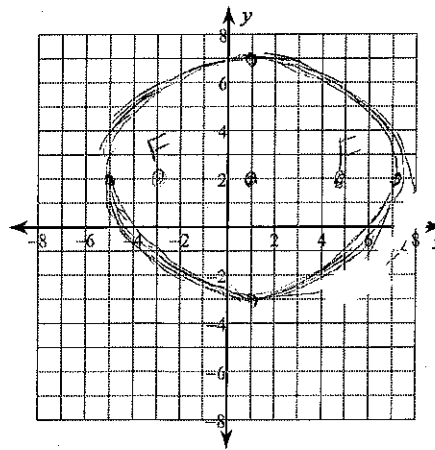
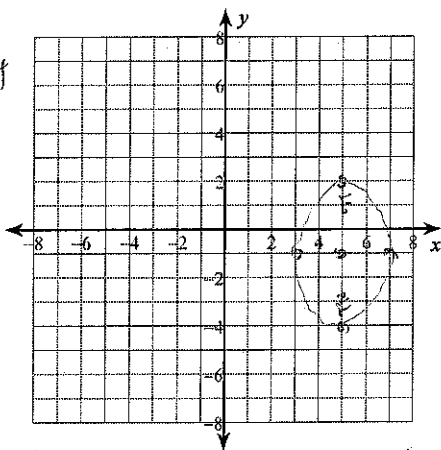
Identify the vertices, co-vertices, foci, length of the major axis, and length of the minor axis of each. Then sketch the graph.

3)  $\frac{(x - 5)^2}{4} + \frac{(y + 1)^2}{9} = 1$  Vertical

Horizontal 4)  $\frac{(x - 1)^2}{36} + \frac{(y - 2)^2}{25} = 1$

$c^2 = 36 - 25$   
 $c^2 = 11$   
 $c = \sqrt{11}$

$c^2 = 9 - 4$   
 $c = \sqrt{5}$



Center  $(1, 2)$   
Major = 12  
Minor = 10

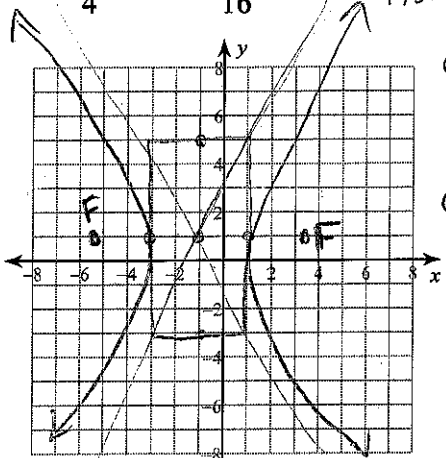
Center  $(5, -1)$  Foci  $(5, -1 + \sqrt{5})$   
 $(5, -1 - \sqrt{5})$   
Vertices  $(5, 2)$   $(5, -4)$   
Co-vertices  $(3, -1)$   $(7, -1)$   
Major = 6 Minor = 4

Vertices  $(7, 2)$   $(-5, 2)$   
Co-vertices  $(1, 7)$   $(1, -3)$   
Foci  $(1 - \sqrt{11}, 2)$   $(1 + \sqrt{11}, 2)$

# Hyperbolas

Identify the vertices, foci, and direction of opening of each. Then sketch the graph.

5)  $\frac{(x+1)^2}{4} - \frac{(y-1)^2}{16} = 1$  X comes first  
Horizontal

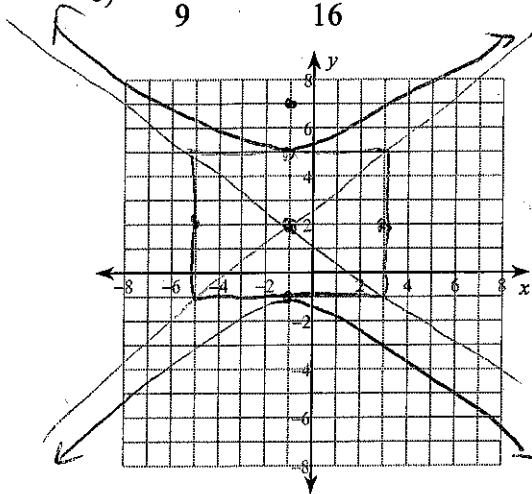


Center  $(-1, 1)$   
 $c^2 = 4 + 16$   
 $c = \sqrt{20}$   
 $c = 2\sqrt{5}$

Vertices  $(-3, 1)$   $(1, 1)$

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

6)  $\frac{(y-2)^2}{9} - \frac{(x+1)^2}{16} = 1$  Vertical  
Y comes first



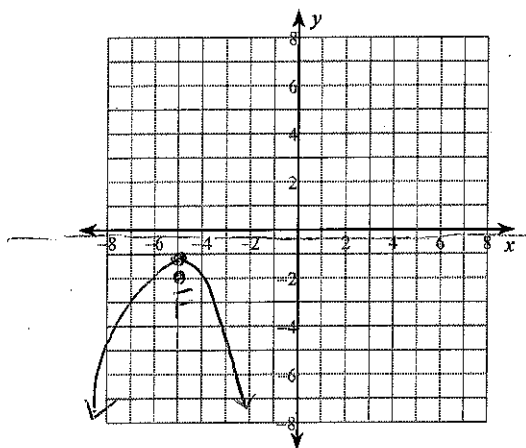
Center  $(-1, 2)$   
 $c^2 = 9 + 16$   
 $c = 5$

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

Foci  $(-1, 7)$   $(-1, -3)$

For each parabola, identify the vertex, focus, directrix, and direction of opening of each. Then sketch the graph.

7)  $y = -\frac{1}{3}(x+5)^2 - 1$



$\frac{1}{3} = \frac{1}{4c}$   
 $4c = 3$   
 $c = \frac{3}{4}$   
 $-1 \pm \frac{3}{4}$   
 $-4/4 \pm 3/4$

Directrix

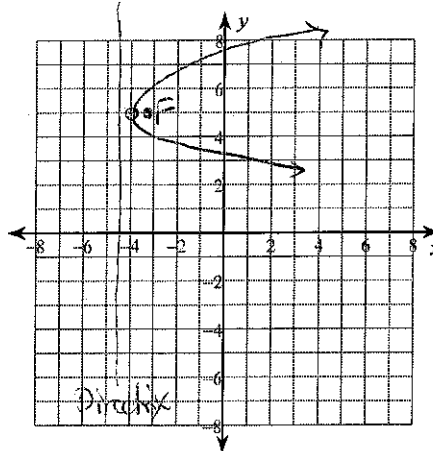
Vertex  $(-5, -1)$

Vertical Parabola, Opens Down

Focus  $(-5, -\frac{7}{4})$

Directrix  $y = -\frac{1}{4}$

8)  $x = 2(y-5)^2 - 4$



Horizontal  
Parabola  
Opens Right

$2 = \frac{1}{4c}$   
 $8c = 1$   
 $c = \frac{1}{8}$

$-4 \pm \frac{1}{8}$   
 $-\frac{32}{8} \pm \frac{1}{8}$

Vertex  $(-4, 5)$

Focus  $(-\frac{31}{8}, 5)$

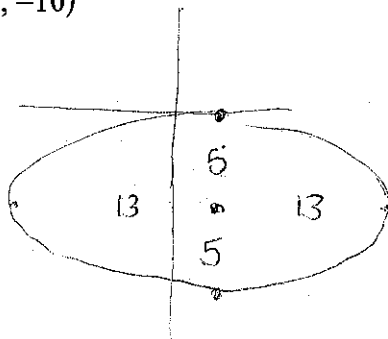
Directrix  $x = -\frac{33}{8}$

For the ellipse points given, tell whether it is vertical or horizontal and identify the center. Then, write the equation of the ellipse.

- 9) Vertices: (15, -5), (-11, -5)  
Co-vertices: (2, 0), (2, -10)

Center (2, -5)

$$\frac{(x-2)^2}{169} + \frac{(y+5)^2}{25} = 1$$

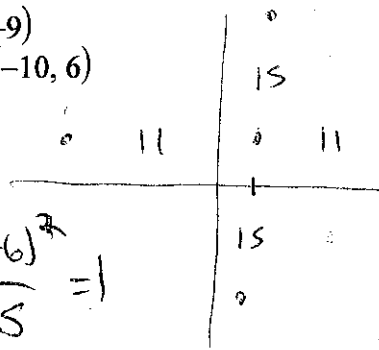


Horizontal

- 10) Vertices: (1, 21), (1, -9)  
Co-vertices: (12, 6), (-10, 6)

Center (1, 6)

$$\frac{(x-1)^2}{121} + \frac{(y-6)^2}{225} = 1$$



Vertical

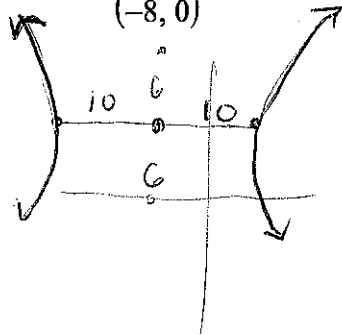
For the hyperbola points given, tell whether it is vertical or horizontal and identify the center. Then, write the equation of the hyperbola.

- 11) Vertices: (2, 6), (-18, 6)  
Endpoints of Conjugate Axis: (-8, 12), (-8, 0)

Center (-8, 6)

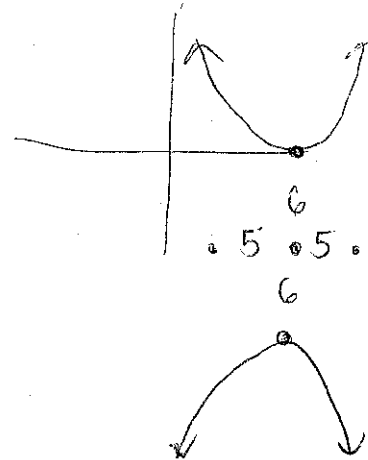
Horizontal (x comes first)

$$\frac{(x+8)^2}{100} - \frac{(y-6)^2}{36} = 1$$



- 12) Vertices: (9, 0), (9, -12) Vertical (y comes first)  
Endpoints of Conjugate Axis: (14, -6), (4, -6)  
Center (9, -6)

$$\frac{(y+6)^2}{36} - \frac{(x-9)^2}{25} = 1$$

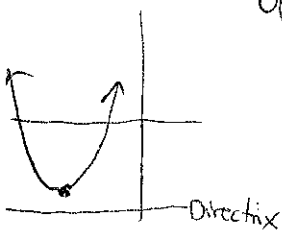


Use the information provided to write the vertex form equation of each parabola.

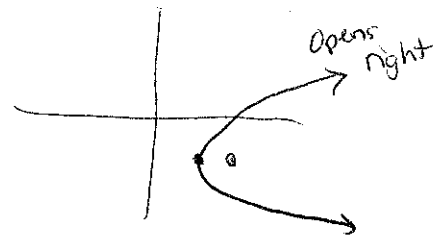
- 13) Vertex: (-4, -7), Directrix:  $y = -\frac{57}{8}$

$-7 \rightarrow -\frac{56}{8}$  so  $c = \frac{1}{8}$   $a = 4(\frac{1}{8}) = 2$   
opens up, vertical parabola

$$y = 2(x+4)^2 - 7$$



- 14) Vertex: (2, -3), Focus:  $(\frac{41}{20}, -3)$



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

$a \rightarrow \frac{40}{20}$

so  $c = \frac{1}{20}$

$a = \frac{1}{4(\frac{1}{20})} = (\frac{1}{5})$

$a = 5$

Horizontal  
Parabola

Identify the conic section provided (circle, ellipse, hyperbola, or parabola) Then convert the shape into Standard Form (Vertex Form for parabolas)

15)  $x^2 + y^2 + 18x - 30y + 302 = 0$

$$(x^2 + 18x + 81) + (y^2 - 30y + 225) = -302$$

+ 81  
+ 225

$$(x+9)^2 + (y-15)^2 = 4$$

Circle

Ellipse

16)  $25x^2 + 9y^2 - 50x + 144y - 299 = 0$

$$25(x^2 - 2x + 1) + 9(y^2 + 16y + 64) = 299$$

+ 25  
+ 576

$$\frac{25(x-1)^2 + 9(y+8)^2}{900} = 1$$

$$\frac{(x-1)^2}{36} + \frac{(y+8)^2}{100} = 1$$

17)  $-9x^2 + 4y^2 - 18x - 24y - 297 = 0$

$$-9(x^2 + 2x + 1) + 4(y^2 - 6y + 9) = 297 - 9 + 36$$

$$-9(x+1)^2 + 4(y-3)^2 = 324$$

324

$$\frac{(x+1)^2}{-36} + \frac{(y-3)^2}{81} = 1$$

order matters!

$$\frac{(y-3)^2}{81} - \frac{(x+1)^2}{36} = 1$$

19)  $y = -5x^2 - 30x - 51$  Vertical Parabola

$$y = -5(x^2 + 6x + \underline{\quad}) - 51 - \underline{\quad}$$

$$y = -5(x^2 + 6x + 9) - 51 - (-45)$$

$$y = -5(x+3)^2 - 6$$

18)  $25x^2 - y^2 - 50x - 8y - 91 = 0$

$$25(x^2 - 2x + 1) - 1(y^2 + 8y + 16) = 91$$

+ 25  
+ (-16)

$$\frac{25(x-1)^2 - 1(y+4)^2}{100} = 1$$

$$\frac{(x-1)^2}{4} - \frac{(y+4)^2}{100} = 1$$

20)  $y = x^2 - 18x + 91$

$$y = (x^2 - 18x + \underline{\quad}) + 91 - \underline{\quad}$$

$$y = (x^2 - 18x + 81) + 91 - 81$$

$$y = (x-9)^2 + 10$$

Vertical Parabola