Identify each of the following conics. Then give the center/vertex. And the direction (unless it is a circle, because circles don't have a direction. Doh.)

1) $\frac{2x^2}{8} + \frac{4y^2}{8} = \frac{8}{8}$ $\quad \frac{x^2}{4} + \frac{y^2}{2} = 1$

Conic? ellipse, $b^2 - 4ac < 0$, $A \neq C$

$0^2 - 4(2)(4)$
$= -32$

Center/~~Vertex~~?
(0,0)

Direction?
horizontal

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

Conic? ellipse

Center/~~Vertex~~?
(0,0)

Direction?
horizontal

3) $(x-1)^2 = -24y$

Conic? parabola

~~Center~~/Vertex?
(1,0)

Direction?
down

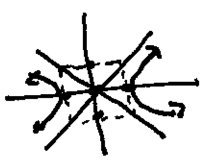
4) $\frac{7x^2}{28} - \frac{7y^2}{28} = \frac{28}{28}$ $\quad \frac{x^2}{4} - \frac{y^2}{4} = 1$

$0^2 - 4(7)(7)$
$= 196$

Conic? Hyperbola

Center/~~Vertex~~? (0,0)

Direction? horizontal
Branches: left + right



5) $(x-4)^2 + (y+25)^2 = 49$

Conic? circle

Center/~~Vertex~~?
(4,-5)

~~Direction?~~

$\frac{(y-4)^2}{14} - \frac{(x+1)^2}{2} = 1$

6) $\frac{(y-4)^2}{14} - \frac{7(x+1)^2}{14} = \frac{14}{14}$

Conic?
Hyperbola

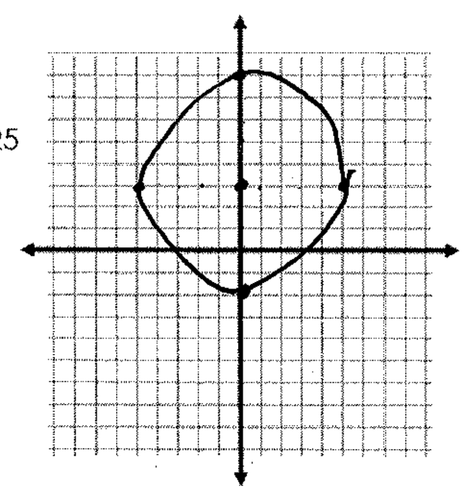
Center/~~Vertex~~?
(-1,4)

Direction? vertical
Branches: up + down

Graph:
3) $x^2 + (y-3)^2 = 25$

Center:
(0,3)

Radius:
5

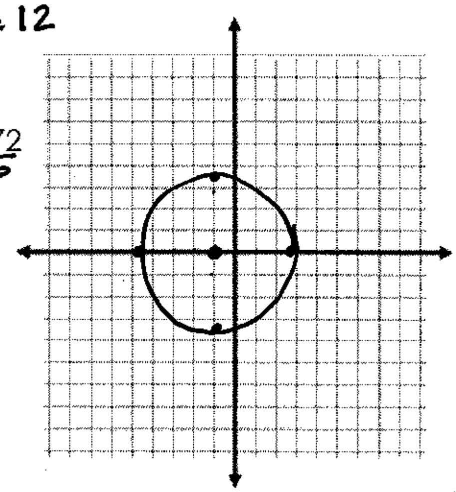


$(x+1)^2 + y^2 = 12$

Graph:
4) $\frac{6(x+1)^2}{6} + \frac{6y^2}{6} = \frac{72}{6}$

Center:
(-1,0)

Radius:
$\sqrt{12} = 2\sqrt{3}$



Circles

A **Hyperbola** is the set of all points P in a plane such that the difference of the distances from P to two fixed points, called the foci, is constant.

Horizontal Transverse Axis

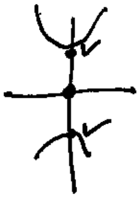
$$\frac{(x-h)^2}{a^2}-\frac{(y-k)^2}{b^2}=1$$

Vertical Transverse Axis

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

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

1) Write the equation of the hyperbola with vertices at $(0,\pm 3)$ and asymptotes of $y=\pm\frac{3}{4}x$.



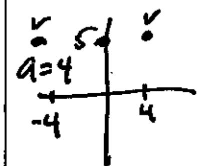
$$\boxed{\frac{y^2}{9}-\frac{x^2}{16}=1}$$

2) Write the equation of the hyperbola with vertices at $(\pm 4,5)$ and foci at $(\pm 2\sqrt{5},5)$

$c=2\sqrt{5}$

$c^2=20$

ctr $(0,5)$



$$\boxed{\frac{x^2}{16}-\frac{(y-5)^2}{4}=1}$$

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

$20=16+b^2$

$4=b^2$

For a hyperbola, the important characteristics are the **Center, Vertices, Co-vertices,** and the **Foci.** Remember that "a" is always in the first denominator. The transverse axis will be horizontal if x is first and vertical if y is first.

Also, you can write the equation of the asymptotes with the following formulas:

Horizontal: $y=\pm\frac{b}{a}x$ Vertical: $y=\pm\frac{a}{b}x$

(THE FORMULAS ONLY WORK IF THE CENTER IS AT THE ORIGIN!)

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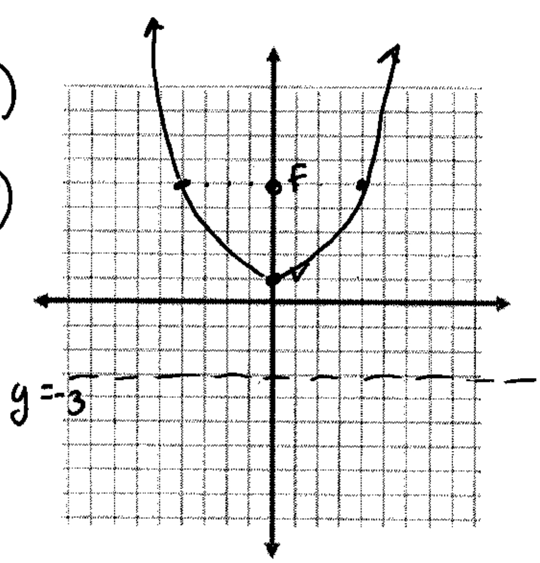
3) $x^2=16(y-1)$ $p=4$

Vertex: $(0,1)$

Focus: $(0,5)$

Directrix: $y=-3$



4) $(y+4)^2=-8(x-3)$

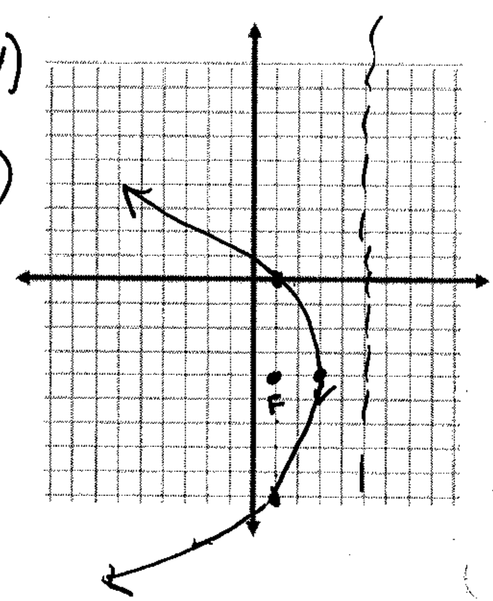
$4p=-8$

$p=-2$

Vertex: $(3,-4)$

Focus: $(1,-4)$

Directrix: $X=5$



Parabolas

An **Ellipse** is the set of all points *P* in a plane such that the sum of the distances from P and two fixed points, called the foci, is constant.

Horizontal

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

Vertical

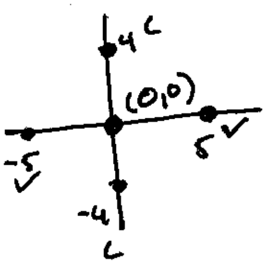
$$\frac{(x-h)^2}{b^2}+\frac{(y-k)^2}{a^2}=1$$

$$c^2=a^2-b^2$$

1. Write the equation of the ellipse with center at the origin, vertices at (-5,0) & (5, 0) and co-vertices at ((0,4) and (0,-4)

Ctr (0,0)

$a=5 \quad b=4$

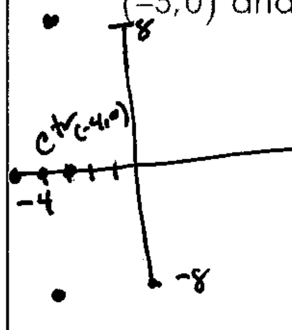


$$\boxed{\frac{x^2}{25}+\frac{y^2}{16}=1}$$

2. Write the equation of the elipse with vertices at $(-4,\pm 8)$ and co-vertices at $(-5,0)$ and $(-3,0)$

$a=8$

$b=1$



$$\boxed{\frac{(x+4)^2}{1}+\frac{y^2}{64}=1}$$

For an Ellipse, the important characteristics are the **Center, Vertices, Co-vertices,** and the **Foci.** Remember that "a" is the larger number and the ellipse will be horizontal if a is beneath x, vertical if a is beneath y

Identify the important characteristics for each of the following parabola and graph it

3) $\frac{(x-2)^2}{9}+\frac{(y+1)^2}{49}=1$

$b=3 \quad a=7$

Center: $(2,-1)$

Vertices: $(2,6)\ (2,-8)$

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

Foci:

$c^2=a^2-b^2$

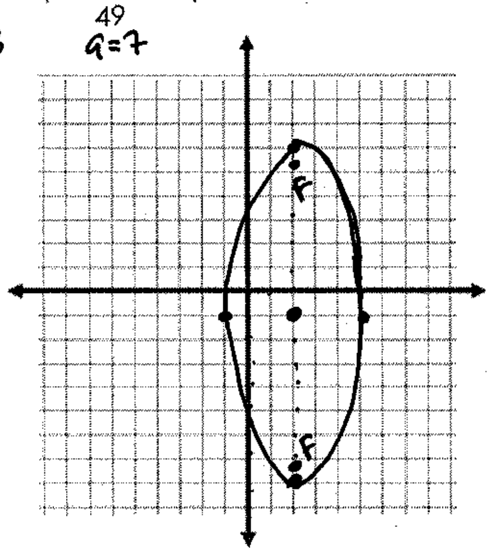
$c^2=49-9$

$\sqrt{c^2}=\sqrt{40}$

$c=2\sqrt{10}$

$(2,-1+2\sqrt{10})$

$(2,-1-2\sqrt{10})$



4) $\frac{x^2}{64}+\frac{(y-4)^2}{9}=1$

Center: $(0,4)$

Vertices: $(8,4)\ (-8,4)$

Co-vertices: $(0,1)\ (0,7)$

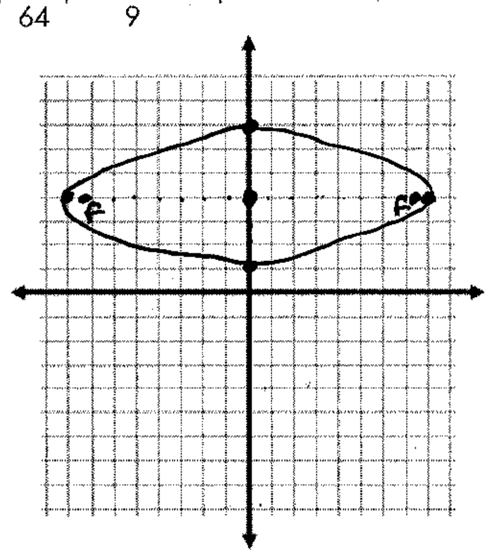
Foci:

$c^2=a^2-b^2$

$c^2=64-9$

$c^2=55$

$(\sqrt{55},4)\ (-\sqrt{55},4)$

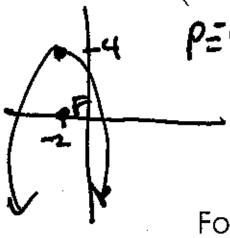


Ellipses

A **Parabola** is the set of all points equidistant from a point called the focus and a line called the directrix.

$$(x-h)^2 = 4p(y-k) \qquad\qquad (y-k)^2 = 4p(x-h)$$

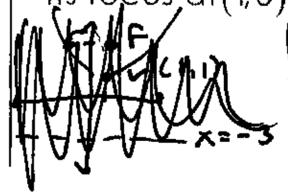
1) Write the equation of the parabola with vertix at $(-2,4)$ and focus at $(-2,0)$.

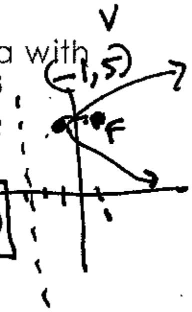


$p=4$

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

2) Write the equation of the parabola with its focus at $(1,5)$ and directrix of $x=-3$





$p=2$

$\boxed{(y-5)^2 = 8(x+1)}$

For a Parabola, the important characteristics are the **Vertex, Focus**, and the **Directrix.** Remember that the Directrix is a line!

Identify the important characteristics for each of the following parabola and graph it

---

For the following hyperbolas, write the equations of the asymptotes..

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

$a=9 \quad b=3$

$m = 3/9 = 1/3$

$\boxed{y = \pm \frac{1}{3}x}$

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

$a=5 \quad b=6$

$m = 5/6$

$\boxed{y = \pm \frac{5}{6}x}$

Identify the important characteristics for each of the following hyperbolas and graph them.

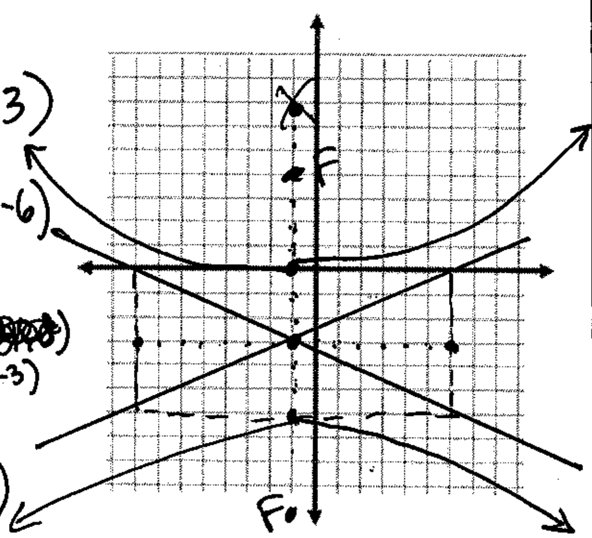
5) $\frac{(y+3)^2}{9} - \frac{(x+1)^2}{49} = 1$

Center: $(-1,-3)$

Vertices: $(-1,0)$ $(-1,-6)$

Co-vertices: $(6,-3)$ $(-8,-3)$

Foci: $(-1,-3+\sqrt{58})$ $(-1,-3-\sqrt{58})$



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

$9 + 49$

$c^2 = 58$

$c = \sqrt{58}$

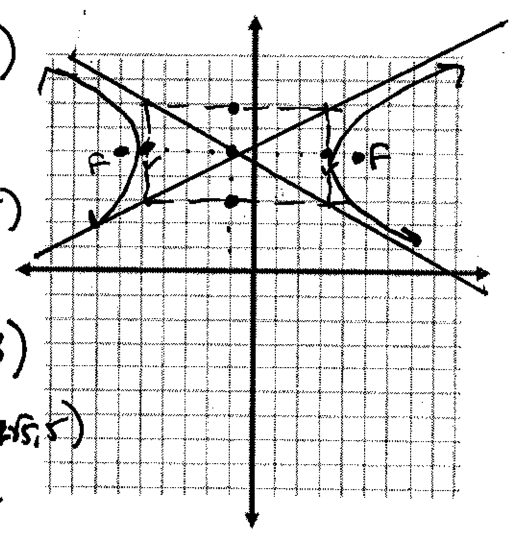
6) $\frac{(x+1)^2}{16} - \frac{(y-5)^2}{4} = 1$

Center: $(-1,5)$

Vertices: $(3,5)$, $(-5,5)$

Co-vertices: $(-1,7)$ $(-1,3)$

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



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

$c^2 = 16+4$

$c^2 = 20$

$c = 2\sqrt{5}$

Hyperbolas

A **Circle** is the set of all points in a plane that are of distance *r* from a fixed point, called the center.

$$(x-h)^2+(y-k)^2=r^2$$

1) Write the equation of the circle with center at (8,7) and radius of 4

$(x-8)^2+(y-7)^2=16$

2) Write the equation of the circle with center at (2,-3) and that goes through the point (-6, 8)

$\boxed{(x-2)^2+(y+3)^2=185}$

$r=\sqrt{(2-(-6))^2+(-3-8)^2}$

$=\sqrt{64+121}$

$r=\sqrt{185}$

$\left(\frac{-6}{2}\right)^2$ $\left(\frac{-4}{2}\right)^2$

7) $4x^2+4y^2-24x-16y=-8$

$(4x^2-24x)+(4y^2-16y)=-8$

$4(x^2-6x+9)+4(y^2-4y+4)=-8+36+16$

$\frac{4(x-3)^2}{4}+\frac{4(y-2)^2}{4}=\frac{44}{4}$

$\boxed{(x-3)^2+(y-2)^2=11}$

Conic? Circle

Center/~~Vertex?~~

$(3,2)$ $r=\sqrt{11}$

~~Direction~~?

$\left(\frac{-10}{2}\right)^2$

8) $y^2-10y-8x+21=0$

$y^2-10y=8x-21$

$y^2-10y+25=8x-21+25$

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

$\boxed{(y-5)^2=8(x+\frac{1}{2})}$

Conic? Parabola

~~Center~~/Vertex?

$(-\frac{1}{2},5)$

Direction?

Right

$\left(\frac{-6}{2}\right)^2$

9) $16x^2-96x+9y^2+36y=78$

$(16x^2-96x)+(9y^2+36y)=78$

$16(x^2-6x+9)+9(y^2+4y+4)=78+144+36$

$\frac{16(x-3)^2}{258}+\frac{9(y+2)^2}{258}=\frac{258}{258}$

Conic? ellipse

Center/~~Vertex?~~

$(3,-2)$

Direction?

vertical

$\left(\frac{4}{2}\right)^2$ $\left(\frac{12}{2}\right)^2$

10) $-2x^2+5y^2+24x-20y-102=0$

$(5y^2-20y)(-2x^2+24x)=102$ +20

$5(y^2-4y+4)-2(x^2+12x+36)$

$\frac{5(y-2)^2}{50}-\frac{2(x+6)^2}{50}=\frac{50}{50}$

$\boxed{\frac{(y-2)^2}{10}-\frac{(x+6)^2}{25}=1}$

Conic? hyperbola

Center/Vertex? $(6,2)$

Direction? Vertical

$\left(\frac{-6}{2}\right)^2$ $\left(\frac{-2}{2}\right)^2$

11) $x^2-4y^2-6x+8y-3=0$

$(x^2-6x)(-4y^2+8y)=3$

$(x^2-6x+9)-4(y^2-2y+1)=3+9-4$

$\frac{(x-3)^2}{8}-\frac{4(y-1)^2}{8}=\frac{8}{8}$

$\boxed{\frac{(x-3)^2}{8}-\frac{(y-1)^2}{2}=1}$

Conic? Hyperbola

Center/Vertex?

$(3,1)$

Direction?

horizontal

12) $9x^2+4y^2+36x-24y+36=0$

$(9x^2+36)+(4y^2-24y)=-36$ +36

$9(x^2+4x+4)+4(y^2-6y+9)$

$\frac{9(x+2)^2}{36}+\frac{4(y-3)^2}{36}=\frac{36}{36}$

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

Conic? Ellipse

Center/Vertex?

$(-2,3)$

Direction?

Vertical

Which is it?