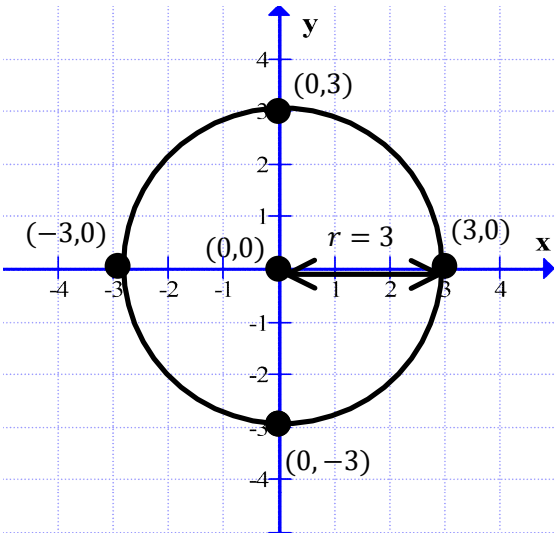
C12 - 12.0 - Conics Circles/Ellipse Notes

Circle: $x^2 + y^2 = 9$

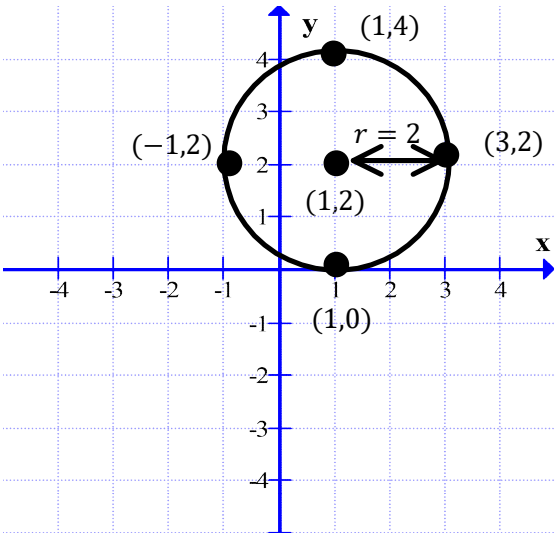


$x^2 + y^2 = r^2$ $\quad Radius = r$

$x^2 + y^2 = 3^2$ $\quad r = 3$

$(x-0)^2 + (y-0)^2 = 3^2$ $\quad Center: (0,0)$

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



$(x-h)^2 + (y-k)^2 = r^2$ $\quad Center: (h,k)$

$(x-1)^2 + (y-2)^2 = 2^2$ $\quad r = 2$

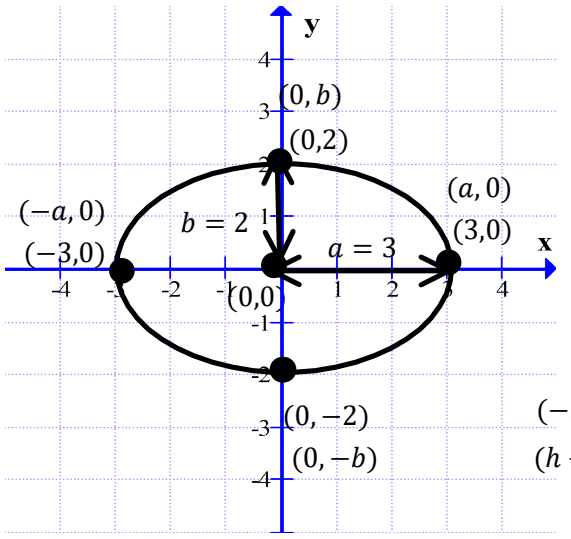
$Center: (1,2)$

Ellipse: $\frac{x^2}{9} + \frac{y^2}{4} = 1$

Get equal to 1.

$\frac{(x+1)^2}{16} + \frac{(y+2)^2}{9} = 1$

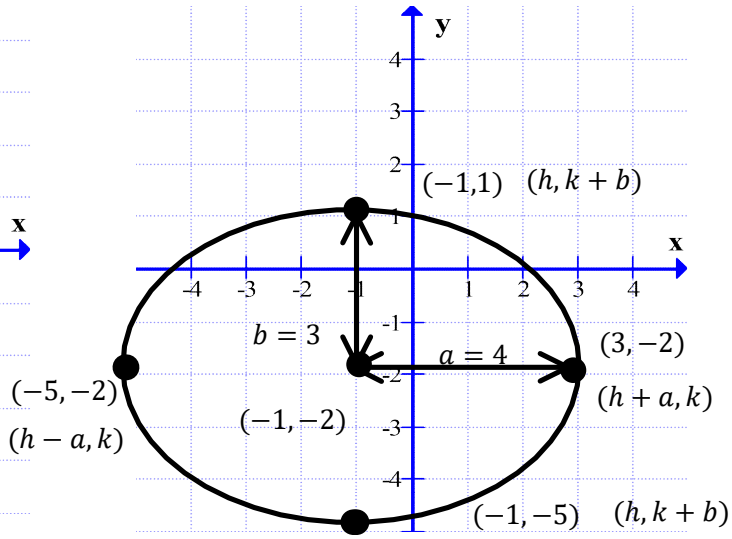
Major Axis - Long
Minor Axis - Short



$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ $\quad x - Radius = a$, $y - Radius = b$

$\frac{x^2}{3^2} + \frac{y^2}{2^2} = 1$ $\quad a = 3$ $\quad b = 2$

$Center:$ $(0,0)$



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

$\frac{(x+1)^2}{4^2} + \frac{(y+2)^2}{3^2} = 1$ $\quad a = 4$ $\quad b = 3$

$Center:$ $(-1,-2)$

$4x^2 + 9y^2 = 36$; $\times$ *both sides by LCD*: 36

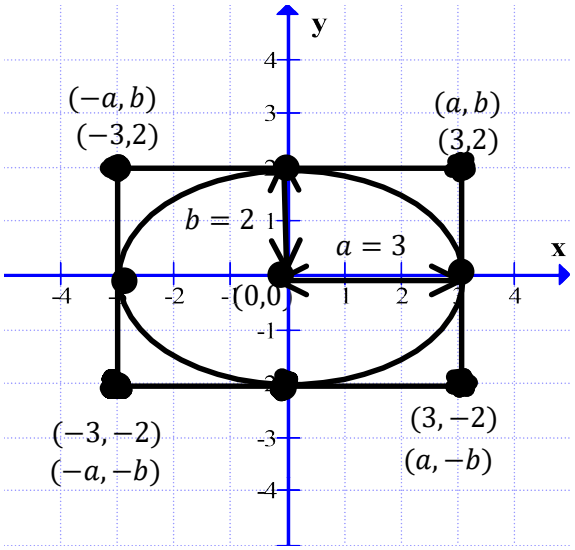
$9(x-1)^2 + 16(y-1)^2 = 144$
$9x^2 - 18x + 16y^2 - 32y - 119 = 0$

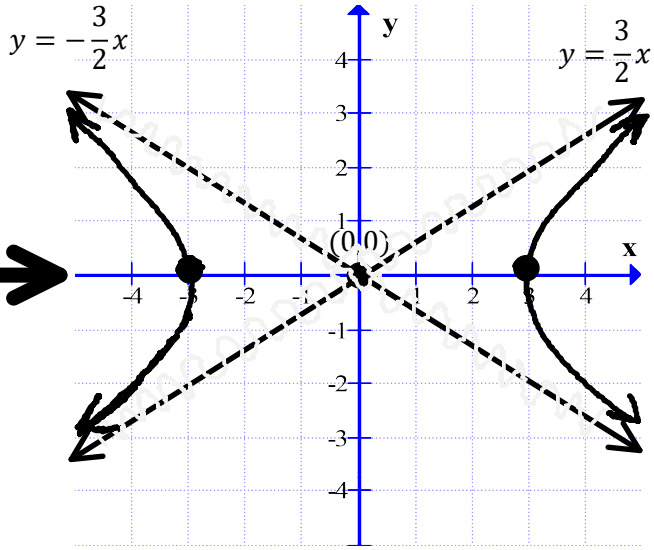
LCD
FOIL
Algebra

C12 - 12.0 - Conics Ellipse/Hyperbola Notes

Hyperbola:

$\frac{x^2}{9} - \frac{y^2}{4} = 1$ *Get equal to* 1.

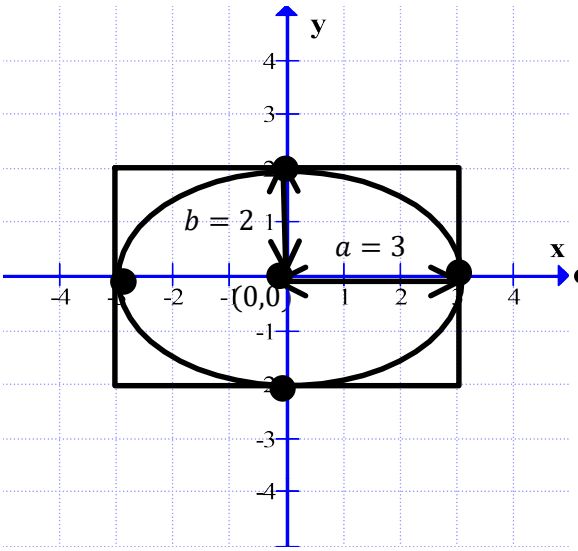


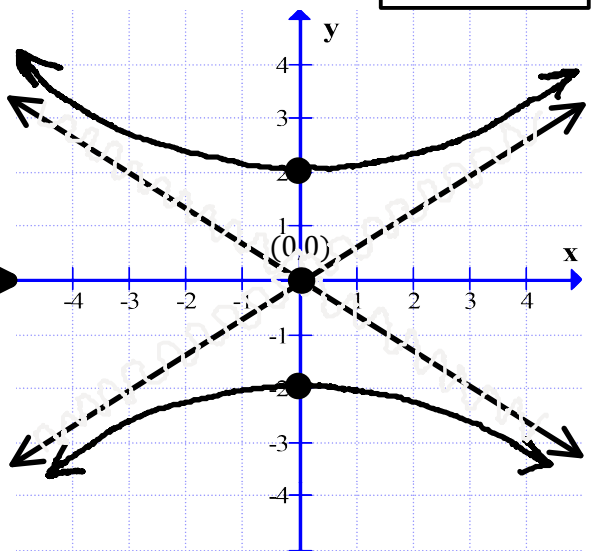


$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ *Center*: (0,0)

$y = mx + b$ *Asymptotes*: $y = \pm\frac{b}{a}x$ $m = \pm\frac{b}{a}$

$\frac{y^2}{9} - \frac{x^2}{4} = 1$ $\frac{x^2}{4} - \frac{y^2}{9} = -1$





$y^2 - x^2; y\ first, Opens\ in\ y - direction$

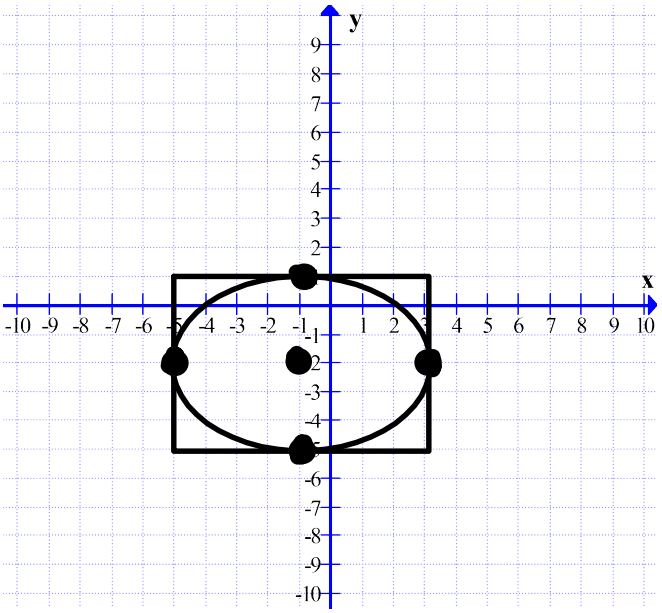
$x^2 - y^2; x\ first, Opens\ in\ x - direction$

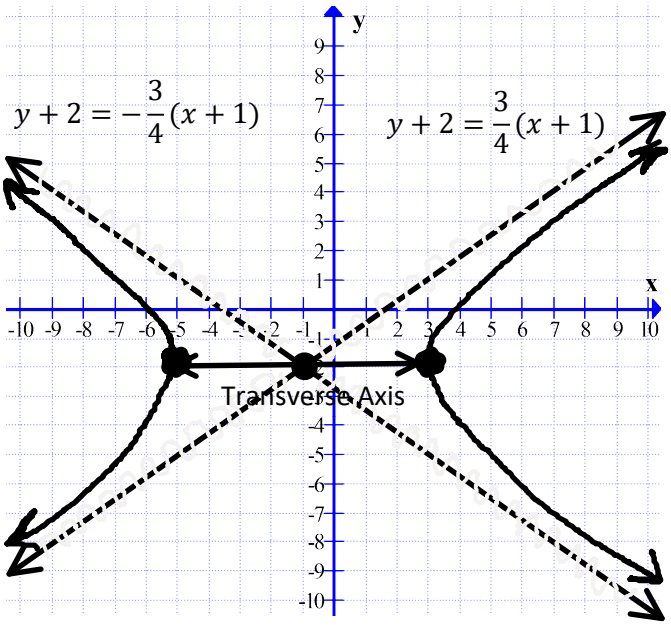
A Hyperbola and an ellipse fuse together at $(\pm a, 0)\ or\ (0, \pm b)$

Draw a box around the Hyperbola; lines through the vertices of the rectangle are the equations of the asymptotes.

C12 - 12.0 - Conics Hyperbola/Conics Notes

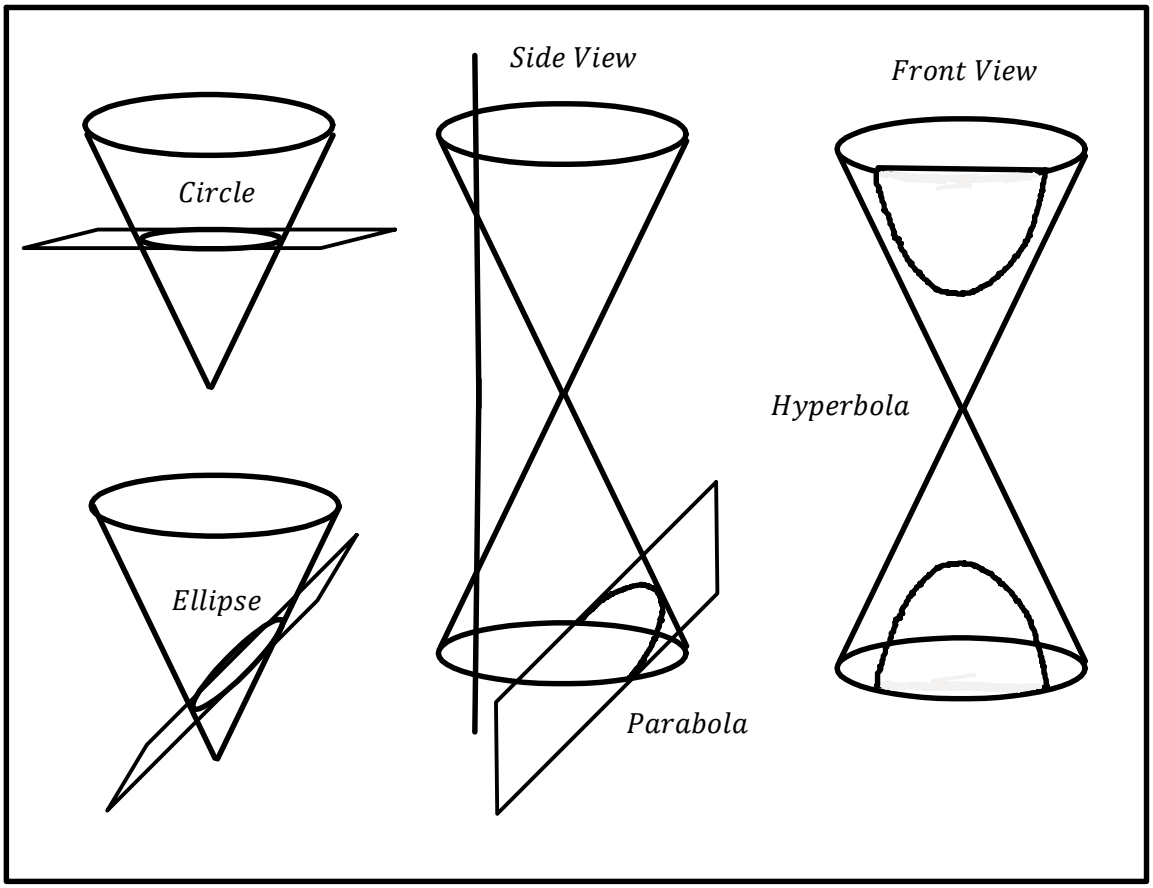
Hyperbola: $\frac{(x+1)^2}{16} - \frac{(y+2)^2}{9} = 1$





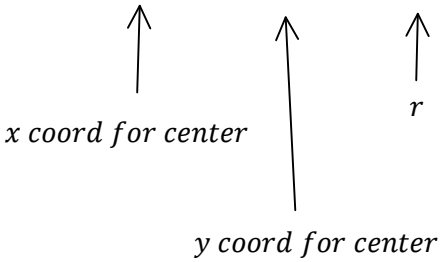
$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$ *Center*: (h,k)

Asymptotes: $y-k=m(x-h)$ $m=\pm\frac{b}{a}$



C12 - 12.0 - Conics Completing the Square: x and y

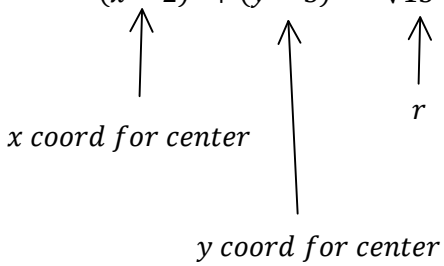
$x^2 - 4x + y^2 - 6y = 0$
$(x^2 - 4x) + (y^2 - 6y) = 0$
$(x^2 - 4x + 4) - 4 + (y^2 - 6y + 9) - 9 = 0$
$(x - 2)^2 + (y - 3)^2 - 13 = 0$
$(x - 2)^2 + (y - 3)^2 = 13$
$(x - 2)^2 + (y - 3)^2 = \sqrt{13}^2$



$0 = Ax^2 + Bxy + Cy^2 + Dx + Ey + F$

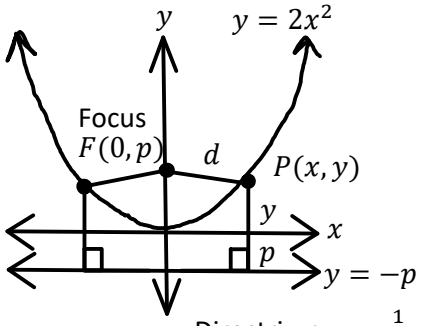
$Circles$:	$x^2, y^2\ same\ sign, A = C$
$Ellipse$:	$x^2, y^2\ same\ sign, A, C > 0, A \neq C$
$Hyperbola$:	$x^2, y^2\ Oppostie\ sign, A < 0 < C\ or\ A > 0 > C$
$Parabola$:	$x^2\ or\ y^2 = 0, Aor\ C = 0$

$3x^2 - 12x - 18y + 3y^2 = 0$ GCF
$3(x^2 - 4x - 6y + y^2) = 0$
$\frac{3(x^2 - 4x - 6y + y^2)}{3} = \frac{0}{3?}$
$x^2 - 4x - 6y + y^2 = 0$
$x^2 - 4x + y^2 - 6y = 0$
$(x^2 - 4x) + (y^2 - 6y) = 0$
$(x^2 - 4x + 4) - 4 + (y^2 - 6y + 9) - 9 = 0$
$(x - 2)^2 + (y - 3)^2 - 13 = 0$
$(x - 2)^2 + (y - 3)^2 = 13$
$(x - 2)^2 + (y - 3)^2 = \sqrt{13}^2$



C12 - 12.0 - Conics Notes

Parabola: The distance from the focus to the parabola and straight down to the directrix is equal. $\boxed{d = y + p}$



Directrix: $y = -\frac{1}{8}$

Focus: $\left(0, \frac{1}{8}\right)$

$y = ax^2 \ldots$

$y = \frac{x^2}{4p}$

$a = \frac{1}{4p}$

$\frac{1}{4p} = 2$

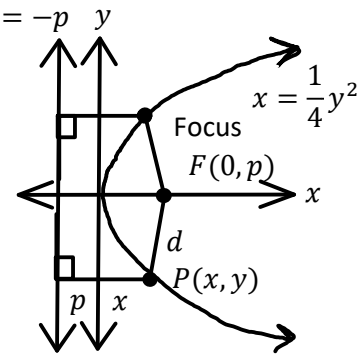
$p = \frac{1}{8}$

$x = ay^2 \ldots$

$x = \frac{y^2}{4p}$

$\frac{1}{4p} = \frac{1}{4}$

$p = 1$

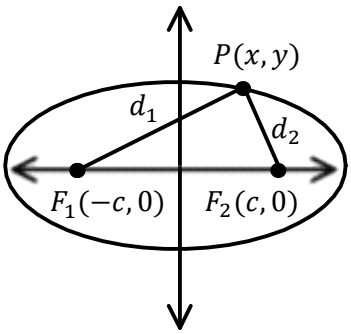


Directrix: $x = -1$

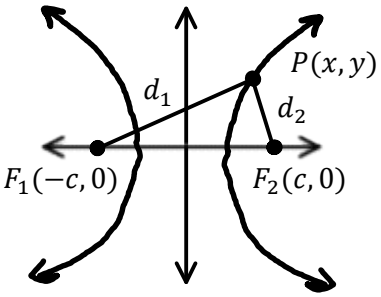
Focus: $(1,0)$

Ellipse: The sum distances from the Ellipse to the Foci is constant. $d_1 + d_2$; $constant$!

Hyperbola: The difference in the distance from the Hyperbola to the Foci is constant. $d_1 - d_2$; $constant$!



Focus/i: Inside Parabola*
Directrix: Outside Parabola*



c: Distance from Centre on Major/Transverse-Axis

$c = \sqrt{a^2 - b^2}\,; a \geq b$

$c = \sqrt{b^2 - a^2}\,; b \geq a$

Eccentricity:

$e = \frac{c}{a}\ a > b$

$e = \frac{c}{b}\ b > a$

$\frac{(x+1)^2}{16} + \frac{(y+2)^2}{9} = 1$

$c = \sqrt{16 - 9}$

$c = \sqrt{5}$

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

Directrix: Line Perpendicular away from Centre on Major/Transverse-Axis

$x = \frac{a^2}{c}\ ; a > b$

$y = \frac{b^2}{c}\ ; b > a$

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

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

$c = \sqrt{16 + 9}$

$c = 5$

Foci: $(-1 \pm 5, -2)$

$(4, -2)$ & $(-6, -2)$

$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$

$Circles$:	$x^2, y^2\ same\ sign, A = C$
$Ellipse$:	$x^2, y^2\ same\ sign, A, C > 0, A \neq C$
$Hyperbola$:	$x^2, y^2\ Oppostie\ sign, A < 0 < C\ or\ A > 0 > C$
$Parabola$:	$x^2\ or\ y^2 = 0, A\ or\ C = 0$