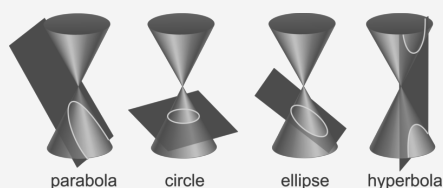


Parabolas with vertex (h,k)

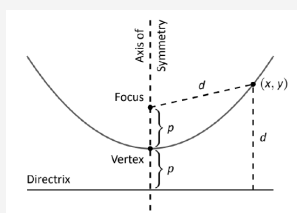
Opening up/down	$(x-h)^2 = \pm 4p(y-k)$
Vertical Focus	$(h, k+p)$
Directrix	$y=k-p$
Opening right/left	$(y-k)^2 = \pm 4p(x-h)$
Horizontal Focus	$(h+p, k)$
Directrix	$x = h-p$

Any point on a parabola is equidistant from the parabola's focus and directrix

Conic Cross-Sections Diagram



Parabola opening upwards



Circles/Ellipses with center (h,k)

Circle	$(x-h)^2 + (y-k)^2 = r^2$
Circle Focus	(h,k)
Circle Vertices	None
Wide Ellipse	$(x-h)^2/a^2 + (y-k)^2/b^2 = 1$
Wide Foci	$(h \pm c, k)$
Wide Vertices	$(h \pm a, k \pm b)$
Tall Ellipse	$(x-h)^2/b^2 + (y-k)^2/a^2 = 1$
Tall Foci	$(h, k \pm c)$

Circles/Ellipses with center (h,k) (cont)

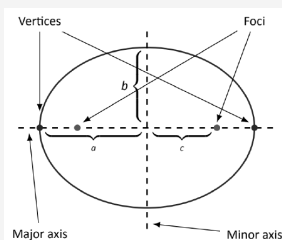
Tall Vertices $(h \pm b, k \pm a)$

$c^2 = a^2 - b^2$ and $a > b > 0$

Formulas for foci generate two different points (+c and -c), and formulas for vertices generate four different vertices: (h+a, k) (h-a, k) (h, k+b) and (h, k-b)

Distances between a focal point to any point on the ellipse, plus the distance of the other focal point to that same point on the ellipse, gives a sum of distances that is constant for any point on the ellipse

Wide Ellipse



Hyperbolas with center (h,k)

Branches opening horizontally	$(x-h)^2/a^2 - (y-k)^2/b^2 = 1$
Horizontal Foci	$(h \pm c, k)$
Horizontal Vertices	$(h \pm a, k)$
Asymptotes	$y-k = \pm (b/a)(x-h)$
Branches opening vertically	$(y-k)^2/a^2 - (x-h)^2/b^2 = 1$
Vertical Foci	$(h, k \pm c)$
Vertical Vertices	$(h, k \pm a)$

Hyperbolas with center (h,k) (cont)

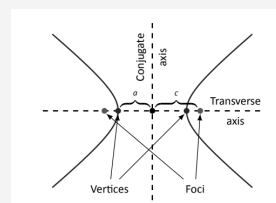
Asymptotes $y-k = \pm (b/a)(x-h)$

$c^2 = a^2 + b^2$ and $a, b \neq 0$

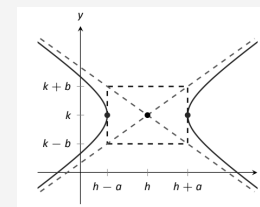
Formulas for foci generate two different points (+c and -c), formulas for vertices generate two different points (+a and -a), and formulas for asymptotes generate two different asymptotes (+a/b and -a/b) or +b/a and -b/a

Distance of a focal point to a point on either hyperbola branch, minus distance of the other focal point to that same point on that same hyperbola branch, gives a value whose magnitude is constant for any point on either hyperbola branch

Horizontal Hyperbola



Horizontal Hyperbola Asymptotes



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Page 1 of 1.

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