Conic Sections Cheat Sheet

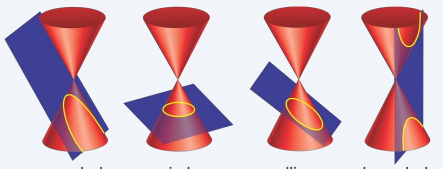
by CROSSANT (CROSSANT) via cheatography.com/186482/cs/38990/

Parabolas with vertex (h,k)

Opening up/down	$(x-h)^2=\pm4p(y-k)$
Vertical Focus	(h, k+p)
Directrix	y=k-p
Opening right/left	$(y-k)^2=\pm4p(x-h)$
Horizontal Focus	(h+p, k)
Directrix	x=h-p

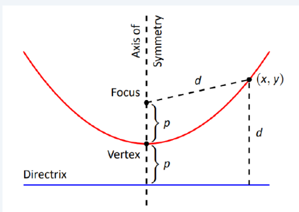
Any point on a parabola is equidistant from the parabola's focus and directrix

Conic Cross-Sections Diagram



parabola circle ellipse hyperbola

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±c, k)
Wide Vertices	(h±a, k±b)
Tall Ellipse	$(x-h)^2/b^2+(y-k)^2/a^2=1$
Tall Foci	(h, k±c)

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

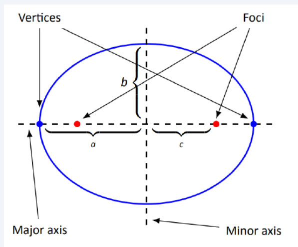
Tall Vertices	(h±b, k±a)

$c^2=a^2-b^2$ and $|a|\geq|b|>0$

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)

Pair opening left and right	$(x-h)^2/a^2-(y-k)^2/b^2=1$
Horizontal Foci	(h±c, k)
Horizontal Vertices	(h±a, k)
Asymptotes	y-k=±(b/a)(x-h)
Pair opening up and down	$(y-k)^2/a^2-(x-h)^2/b^2=1$
Vertical Foci	(h, k±c)
Vertical Vertices	(h, k±a)

Hyperbolas with center (h,k) (cont)

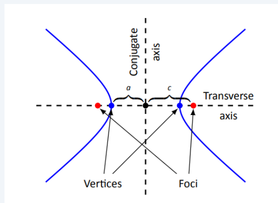
Asymptotes	y-k=±(a/b)(x-h)

$c^2=a^2+b^2$, $|a|\neq0$, $|b|\neq0$

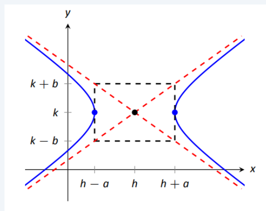
Formulas for foci generate two different points (+c and -c), formulas for vertices generate two different points (+a and -a), and formulas for asymptotes generate two different asymptotes (+(a/b) and -(a/b) or +(b/a) and -(b/a))

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 pair of Hyperbolas



Horizontal Hyperbola Asymptotes



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