Conics Summary

Conic Section	Standard Form	Other Info.
Circle Centre (h,k) Radius r	$$(x-h)^2 + (y-k)^2 = r^2$$	Derived from the distance formula.
Parabola - Vertex (h,k) Focus $(h, k+c)$ Directrix at $y = k - c$	$$(x-h)^2 = 4c(y-k)$$	$c > 0$ opens up, $c < 0$ opens down
Foci $(h+c, k)$ Directrix at $x = h - c$	$$(y-k)^2 = 4c(x-h)$$	$c > 0$ opens right, $c < 0$ opens left

• **Ellipse** - Centre (h,k)
 	
• Horizontal major axis: a > b
  Vertices: $(h \pm a, k)$
  Foci: $(h \pm c, k)$
 	
• Vertical major axis: a > b
 	
  Vertices: $(h, k \pm a)$
  Foci: $(h, k \pm c)$
	$$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$$
	
	$$\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$$
		• The longer axis is called the major axis, the shorter axis is called the minor axis.
		• 'a' is the distance from the centre to each vertex (the end of the major axis).
		• 'b' is the distance from the centre to the end of the minor axis.
		• 'c' is the distance from the centre to each focus.
		$$c^2 = a^2 - b^2$$
		• Length of major axis = 2a
		• Length of minor axis = 2b

• **Hyperbola** - Centre (h,k)
 	
• Horizontal transverse axis (x coefficient is positive)
  Vertices: $(h \pm a, k)$
  Foci: $(h \pm c, k)$
 	
Asymptote: $y - k = \pm \frac{b}{a}(x-h)$
 	
• Vertical transverse axis (y coefficient is positive)
  Vertices: $(h, k \pm a)$
  Foci: $(h, k \pm c)$
 	
Asymptote : $y - k = \pm \frac{a}{b}(x-h)$
	$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$
	
	$$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$$
		• 'a' is the distance from the centre to each vertex.
		• 'b' is a point on the conjugate axis but is not a point on the hyperbola (it helps determine asymptotes)
		• 'c' is the distance from the centre to each focus.
		$$c^2 = a^2 + b^2$$
		• N.B. The transverse axis is <u>not necessarily</u> the longer axis but is associated with whichever variable is positive.