Decentered Conics

MTH 232 | Prof. Townsend | Fall 2010

Parabola

Focus: (x_F, y_F) **Directrix axial point:** (x_D, y_D) **Vertex:** (h,k)

Horizontal Parabola axis: $y = k$	Vertical Parabola axis: $x = h$
$(y-k)^2 = 4p(x-h)$	$(x-h)^2 = 4p(y-k)$
$y^2 - 4px - 2ky + k^2 + 4ph = 0$	$x^2 - 4py - 2hx + h^2 + 4pk = 0$
$x_F = h + p$ $x_D = h - p$	$y_F = k + p$ $y_D = k - p$
$h = \frac{x_F + x_D}{2}$ $p = \frac{x_F - x_D}{2}$	$k = \frac{y_F + y_D}{2}$ $p = \frac{y_F - y_D}{2}$

Ellipse($a > b$)/Circle ($a = b = \sqrt{r}$)

Horizontal Ellipse	Vertical Ellipse
$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$	$\frac{(y-k)^2}{a^2} + \frac{(x-h)^2}{b^2} = 1$
$b^2x^2 + a^2y^2 - 2b^2hx - 2a^2ky + (b^2h^2 + a^2k^2 - a^2b^2) = 0$	$a^2x^2 + b^2y^2 - 2a^2hx - 2b^2ky + (a^2h^2 + b^2k^2 - a^2b^2) = 0$

Hyperbola

Horizontal Hyperbola	Vertical Hyperbola
$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$	$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$
$b^2x^2 - a^2y^2 - 2b^2hx + 2a^2ky + (b^2h^2 - a^2k^2 - a^2b^2) = 0$	$-a^2x^2 + b^2y^2 + 2a^2hx - 2b^2ky + (-a^2h^2 + b^2k^2 - a^2b^2) = 0$