

Conic Section Review

CIRCLE:



A quadratic equation whose two squared terms have coefficients which are equal.

Standard form:

$$Ax^2 + Bx + Cy^2 + Dy + E = 0 \quad \boxed{A = C}$$

General form:

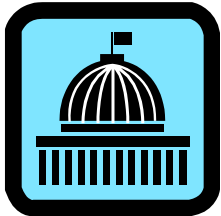
$$(x-h)^2 + (y-k)^2 = r^2$$

- Center is (h, k)
- Radius is r

Parametric Equations:

$$\begin{aligned} x &= h + r \cos t \\ y &= k + r \sin t \end{aligned}$$

ELLIPSE:



A quadratic equation whose two squared terms have coefficients which are unequal. ($AC > 0$ $A \text{ cannot equal } C$)

Standard form:

$$Ax^2 + Bx + Cy^2 + Dx + E = 0 \quad A \neq C$$

General form
(horizontal):

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

General form
(vertical):

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

- Center is (h, k)
- Length of major axis is $2a$
- Length of minor axis is $2b$
- Equation for finding foci is: $c^2 = a^2 - b^2$

Parametric Equations
(horizontal):

$$\begin{aligned} x &= h + a \cos t \\ y &= k + b \sin t \end{aligned}$$

Parametric Equations
(vertical):

$$\begin{aligned} x &= h + b \cos t \\ y &= k + a \sin t \end{aligned}$$

HYPERBOLA:



A quadratic equation whose two squared terms have coefficients which are different signs. ($AC < 0$)

Standard form:

$$Ax^2 + Bx - Cy^2 + Dy + E = 0$$

A, C
one negative

General form
(horizontal):

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

opens
Left + Right

General form
(vertical):

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

opens
Up + Down

- Center is (h, k)
- Slope of asymptotes is $\pm \frac{b}{a}$ (hor.) or $\pm \frac{a}{b}$ (vert.)
- Equation for finding foci is: $c^2 = a^2 + b^2$

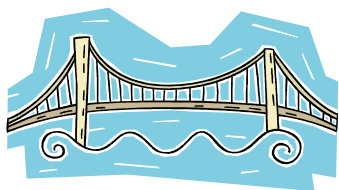
Parametric Equations
(horizontal):

$$\begin{aligned} x &= h + a \sec t \\ y &= k + b \tan t \end{aligned}$$

Parametric Equations
(vertical):

$$\begin{aligned} x &= h + b \tan t \\ y &= k + a \sec t \end{aligned}$$

PARABOLA:



A quadratic equation which has one squared term.
($AC=0$, $A=0$ or $C=0$)

Standard form:

$$Ax^2 + Bx + Dy + E = 0$$

OR Cy^2 with
No Ax^2 term

General form
(horizontal):

$$(x-h)^2 = 4p(y-k)$$

function
opens
up/down

General form
(vertical):

$$(y-k)^2 = 4p(x-h)$$

Not a function
opens
Left/Right

- Vertex is (h, k)
- Focus is p away from vertex
- Directrix is $x = \text{---}$ or $y = \text{---}$ (p away from vertex)
- Focal width is $4p$