PHYSICS PHOR PHUN
PASO ROBLES, CA

CONIC SECTIONS

MATH AND SCIENCE TUTORING
805-610-1725

Solving Quadratics

$$ax^2 \pm bx \pm c = 0$$

Factoring

$$(x+y)^2 = x^2 + 2xy + y^2$$
$$(x-y)^2 = x^2 - 2xy + y^2$$
$$(x+y)(x-y) = x^2 - y^2$$
$$(d \pm e)(f \pm g) = df \pm dg \pm ef \pm eg$$

Perfect square

$$x^2 \pm 2cx + c^2 = 0$$

Completing the square

for $ax^2 \pm bx \pm c = 0$
a must $= 1$,
move c to right side,
add $(b/2)^2$ to both sides.

The quadratic equation

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

*sung to the tune of *Pop goes the weasel*.

Rational polynomial expressions

Factor polynomials and cancel common factors first.

long division

$$\begin{array}{r} x^2 \qquad \pm 1 \\ x \pm 1 \overline{) x^3 \pm x^2 \pm x \pm 1} \\ - \underline{x^3 \pm x^2} \\ - \; x \pm 1 \end{array}$$

for any expression like...

$$\frac{x^3 \pm x^2 \pm x \pm 1}{(x \pm 1)}$$

synthetic division

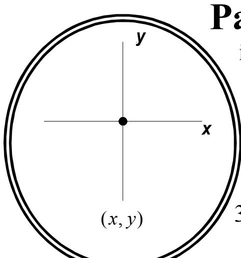
-1 |	1	1	1	1
+	↓	-1	0	-1
	1	0	1	0 ← remainder
	x^2	x^1	x^0	

Curve Sketching

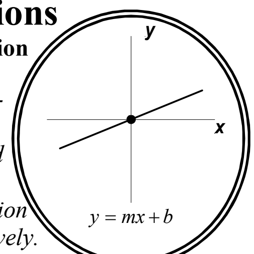
Parent functions

in standard position

1. *Simplify the expression.*
2. *Put in standard form.*
3. *h & k shift function in x & y respectively.*

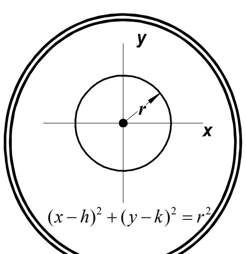


point



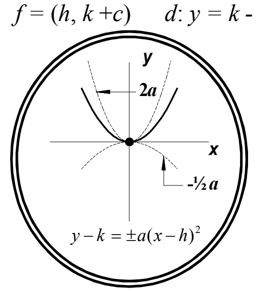
line

circle -
All points equidistant from a central focus, f, by distance r.

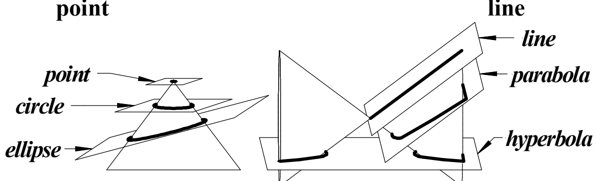


circle

parabola -
All points equidistant from a focus, f and a directrix, d by a minimum distance 2c.
$c = 1/(4a)$
$f = (h, k + c)$ $\quad d: y = k - c$

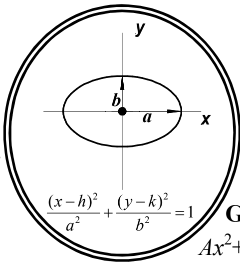


parabola



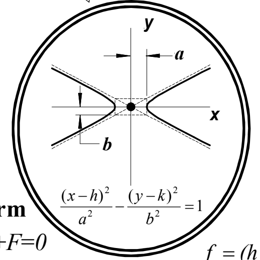
ellipse -
All points whose distance from 2 focal points is a constant sum.

$$f = (h \pm \sqrt{a^2 - b^2}, k)$$



ellipse

General Conic Form
$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$



hyperbola

hyperbola -
All points whose distance from 2 focal points is a constant difference.

$$f = (h \pm \sqrt{a^2 + b^2}, k) \qquad m_{asymp} = \pm\frac{b}{a}$$