

Line

General equation

$$Ax+By+C=0$$

Point slope equation

$$y-y_1=m(x-x_1)$$

Slope of a straight line (m)

$$m=-A/B$$

$$m=(y_2-y_1)/(x_2-x_1)$$

$$m=\tan(\alpha)$$

Positions relative to two lines

Equations

$$Ax+By+C=0$$

$$A'x+B'y+C'=0$$

Secant lines

$$A/A' \neq B/B'$$

Parallel lines

$$A/A' = B/B' \neq C/C'$$

Coincident lines

$$A/A' = B/B' = C/C'$$

Parallel lines

Slope

$$m_1 = m_2$$

$$-A/B = -A'/B'$$

Perpendicular lines

Slope

$$m_1 \cdot m_2 = -1$$

$$-A/B = B'/A'$$

Points

Coordinates

$$P(x_1, y_1)$$

$$Q(x_2, y_2)$$

$$M(x_3, y_3)$$

Distance between two points (P and Q)

$$d = \sqrt{[(x_2-x_1)^2 + (y_2-y_1)^2]}$$

Midpoint (M)

$$x_3 = (x_1+x_2)/2$$

$$y_3 = (y_1+y_2)/2$$

Distance from a point (P) to a line

$$d = |(A \cdot x_1 + B \cdot y_1 + C) / \sqrt{a^2 + b^2}|$$

Circumference

Ordinary equation

$$(x-a)^2 + (y-b)^2 = r^2$$

Elements

$$\text{Center: } C(a, b)$$

$$\text{Point: } P(x, y)$$

$$\text{Radius: } r$$

General equation

$$x^2 + y^2 + Ax + By + C = 0$$

If:

$$(A/2)^2 + (B/2)^2 - C > 0$$

x and y don't multiply

x^2 and y^2 have 1 as coefficient

Elements

$$A = -2a$$

$$B = -2b$$

$$C = a^2 + b^2 - r$$

Ellipse

Equation

$$[(x-x_0)^2]/(a^2) + [(y-y_0)^2]/(b^2) = 1$$

$$\text{Center: } C(x_0, y_0)$$

$$\text{Horizontal radius: } a$$

$$\text{Vertical radius: } b$$

Parabola

General equation

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

If:

$$A \neq 0 \vee B \neq 0$$

$$B^2 - 4AC = 0$$

Vertical Parabola Ordinary Equation

$$(x-x_0)^2 = 2p(y-y_0)$$

$$\text{Vertex: } V(x_0, y_0)$$

$$\text{Parameter: } p$$

Horizontal Parabola Ordinary Equation

$$(y-y_0)^2 = 2p(x-x_0)$$

$$\text{Vertex: } V(x_0, y_0)$$

$$\text{Parameter: } p$$

Hyperbola

General equation

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

If:

$$A \neq 0 \wedge B \neq 0$$

$$A \cdot B < 0$$

Ordinary Equation (horizontal focal axis)

$$[(x-x_0)^2]/(a^2) - [(y-y_0)^2]/(b^2) = 1$$

Ordinary Equation (vertical focal axis)

$$[(y-y_0)^2]/(b^2) - [(x-x_0)^2]/(a^2) = 1$$

Equilateral Hyperbola Equation

$$a = b$$

Asymptotes

$$y = x$$

$$y = -x$$

Elements

$$\text{Center: } O(x_0, y_0)$$

Length of the semimajor axis of the hyperbola: a

Length of the semi-minor axis of the hyperbola: b



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Published 2nd February, 2024.

Last updated 2nd February, 2024.

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