

# 1.3: Coordinate Geometry

Alex L.

September 30, 2024

## 0.1 Lines

The formula for a straight line graph is

$$y = mx + c$$

An alternate form is

$$ax + by + k = 0$$

where  $m = \frac{-a}{b}$  and  $c = \frac{-k}{b}$  and the x and y intercepts are  $\frac{-k}{a}$  and  $\frac{-k}{b}$  respectively.

If there is a power relationship between the two variables,  $y = Ax^n$ , then this can also be turned into a straight line by taking the natural log of both sides:  $\ln y = n \ln x + \ln A$ . In this form, the slope gives the power of  $x$ .

## 0.2 Conics

**Def:** A conic section takes the form  $Ax^2 + By^2 + Cxy + Dx + Ey + F = 0$ , and represent plane intersections of a double cone (an hourglass shape). They can take the form of either a parabola, a hyperbola, an ellipse, or a degenerate form, two straight lines.

The standard form for an ellipse:  $\frac{(x-a)^2}{a^2} + \frac{(y-b)^2}{b^2} = 1$

The standard form for a parabola:  $(y - b)^2 = 4a(x - a)$

The standard form for a hyperbola:  $\frac{(x-a)^2}{a^2} - \frac{(y-b)^2}{b^2} = 1$

If  $C$  is nonzero, this indicates that the conic section is rotated, and so cannot be placed in standard form without a rotation of the axes.