

Polar Coordinates

Moving from Cartesian coordinates to polar

Where (x, y) and $[r, \theta]$:

$$\begin{aligned}r &= \sqrt{a^2 + b^2} \\ \tan \theta &= \frac{y}{x} \\ x &= r \cos \theta \\ y &= r \sin \theta\end{aligned}$$

The distance between two points

Two Cartesian coordinates (x_1, y_1) and (x_2, y_2) is given by: $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Two Polar Coordinates (r_1, θ_1) and (r_2, θ_2) is given by: $\sqrt{r_1^2 + r_2^2 - 2 r_1 r_2 \cos(\theta_1 - \theta_2)}$

Polar equations and graphs

1. $r = \text{constant}$

Equations of the form $r = k$ have graphs that are circles, centre at the origin and radius k .

2. $\theta = \text{constant}$

Equations of the form $\theta = k$ (and $r \geq 0$) have graphs that are half lines, from the origin and making an angle k with the positive x -axis.

3. $r = k\theta$

Equations of the form $r = k\theta$ have graphs that are Archimedes spirals.