



Why

We identified points in \mathbf{R}^2 with elements of the plane in a natural way.¹

Definition

Let $(x, y) \in \mathbf{R}^2$. Then $(r, \theta) \in \mathbf{R}^2$ is the *polar form* or *circular form* of (x, y) if

$$x = r \cos \theta \quad \text{and} \quad y = r \sin \theta.$$

In this case we call r and θ the *circular coordinates* or *polar coordinates*.

Since \sin and \cos polar coordinates are not unique.

Non-uniqueness

A difficulty with polar coordinates is that there are many elements of \mathbf{R}^2 that correspond to the same point in the plane. For example, consider the points

$$(5, \pi/3), (5, -5\pi/3), (-5, 4\pi/3), (-5, -2\pi/3).$$

Each of these specifies the same point in \mathbf{R}^2 .

¹Future editions will expand on this in the genetic approach, and likely reference celestial motion.

