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 difficult 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 $\mathbf{R}^2$.

---

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

Circular Coordinates

Real Plane

Real Order

Geometry   Real Numbers

Rational Numbers

Integer Arithmetic   Sequences

Natural Multiplicative Identity   Natural Additive Identity   Set Numbers   Direct Products

Arithmetic   Identity Elements   Finite Sets

Integer Products   Natural Powers   Operations   Equivalent Sets

Integer Sums   Natural Products   Function Inverses   Family Unions and Intersections

Integer Numbers   Natural Sums   Function Composites   Function Images   Families

Recursion Theorem   Natural Order   Equivalence Relations   Functions

Peano Axioms   Relations

Natural Induction   Cartesian Products

Natural Numbers   Set Powers   Generalized Set Dualities

Partitions   Successor Sets   Intersection of Empty Set   Unordered Triples   Set Dualities   Set Unions and Intersections

Set Intersections   Pair Unions   Ordered Pairs   Set Complements

Set Differences   Set Unions   Pair Intersections

Unordered Pairs   Empty Set

Set Specification

Set Inclusion

Standardized Accounts

Accounts

Deductions

Quantified Statements

Logical Statements

Statements

Sets   Identities

Names

Letters   Objects

4