

Definition: Line

A **line** is a one-dimensional geometric object that extends infinitely in both directions. It is completely determined by any two distinct [Points](#) that lie on it.

Formal Definition

In different mathematical contexts:

1. **Euclidean Geometry:** A line is an undefined primitive satisfying Euclid's axioms, particularly:
 - Through any two distinct points, there exists exactly one line
 - A line contains infinitely many points
2. **Coordinate Geometry:** In \mathbb{R}^2 , a line is the set of all points (x, y) satisfying:

$$ax + by + c = 0$$

where $a, b, c \in \mathbb{R}$ and $(a, b) \neq (0, 0)$

3. **Vector Spaces:** A line through point P in direction \vec{v} is:

$$\ell = \{P + t\vec{v} : t \in \mathbb{R}\}$$

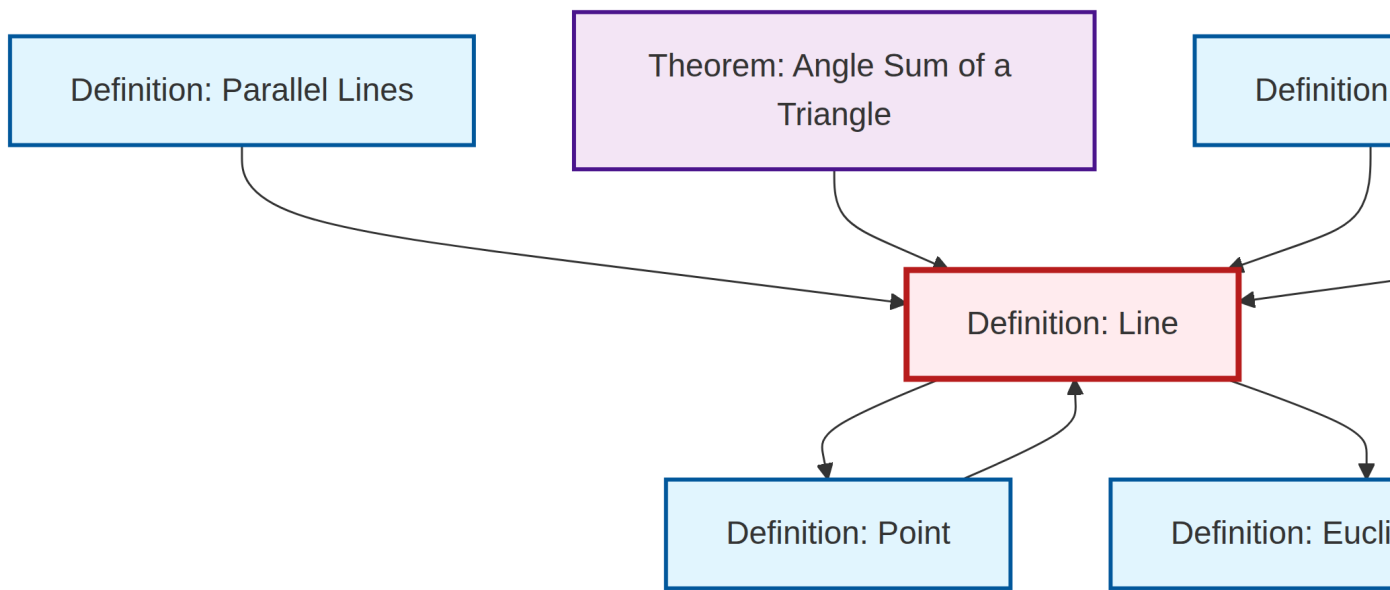
Properties

- Lines have no thickness or width
- Any two distinct lines in a plane either intersect at exactly one point or are parallel
- In [Euclidean Space](#), the shortest path between two points lies along the line connecting them

Related Concepts

- **Line segment:** The portion of a line between two points
- **Ray:** A half-line starting at a point and extending infinitely in one direction
- **Parallel lines:** Lines in the same plane that never intersect
- **Perpendicular lines:** Lines that intersect at a 90° angle

Dependency Graph



Local dependency graph