

# User Manual 3.4.1 Lines

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### Definition

The lines are defined by an origin point and a direction vector (both Vector3D).



### Implementation

Please refer to the [Javadoc](#) for a complete list of public methods.

### Instantiation

A Line(geometry.euclidian.threed) can be created in twi different ways :

- Using the constructor, by giving it two different points of the line.

```
Vector3D p1 = new Vector3D(8, -12, 2);  
Vector3D p2 = new Vector3D(-3, 4, 1);  
Line l2 = new Line(p1, p2, true);
```

- Using the static method createLine(Vector3D, Vector3D) : the first Vector3D is a point of the line, the second one is the direction.

```
Vector3D origin = new Vector3D(-6, 4, 2);  
Vector3D direction = new Vector3D(2, 0, -9);  
Line l1 = Line.createLine(origin, direction );
```

The origin of the line is always computed to be the closest one of the line to the (0, 0, 0) point.

### Usage

The Line class proposes methods to :

- Test if the line identical to another one (they are similar if the contain the same points) :

```
boolean similarLines = line1.isSimilarTo(line2);
```

- the coordinates of the projection of any point of space in the local frame (origin, direction)

```
Vector3D point = new Vector3D(2, 3, 5);  
Vector1D pointOnLine = line.toSubSpace(point);
```

- the coordinates in the global frame of a point expressed in the local frame

```
Vector3D point = p1.toSpace(pointOnLine );
```

- Test if a point belongs to it

```
Vector3D point = new Vector3D(2, 3, 5);  
boolean containsPoint = line1.contains(point);
```

Please refer to the [Interactions with other geometrical objects section](#) for other methods : Line does not implement the Shape interface (it is not a "shape"), but contains methods for interactions with other lines and points (closestPointTo, distance...).

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