Problem: Intersection of Two Spheres

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Can the intersection of two spheres be

1. a line?

2. a plane?

3. a circle?

4. a single-point set?

Solution:

The intersection of two spheres in three-dimensional space can take on different forms, depending on the position and radius of the spheres. Here is an analysis of the mentioned cases:

a) Line:

- No. The intersection of two spheres cannot be a line. Spheres are three-dimensional objects, and their intersection, if not empty, forms at least a two-dimensional surface.

b) Plane:

- No. The intersection of two spheres also cannot be a plane. The intersection of spheres (if not empty) is at most a circle or a set of points, but not a plane.

c) Circle:

- Yes. The intersection of two spheres can be a circle. When two spheres intersect, their intersection forms a circle, which is a curved line in three-dimensional space.

d) Single-point set:

- Yes. The intersection of two spheres can be a single-point set. This happens when the spheres touch at exactly one point, which is possible when one sphere lies outside the other and they touch at precisely one point.

Summary:

In summary, the intersection of two spheres can either be a circle or a single-point set, but it cannot be a line or a plane.