

Question 6

Find and describe the intersection of

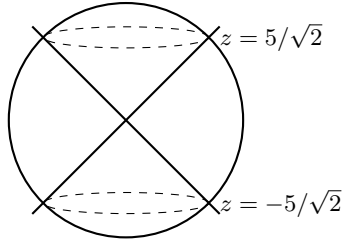
$$x^2 + y^2 + z^2 = 25 \quad \text{and} \quad z^2 = x^2 + y^2.$$

Tasks

1. Determine every component of the intersection.
2. Find each component's exact height and radius.
3. Verify the result in both original equations.

Question 6 – Solution

Strategy Substitute the cone relation into the sphere, then retain both signs of z .



Step 1: Solve for height Since $x^2 + y^2 = z^2$, the sphere gives

$$z^2 + z^2 = 25 \implies 2z^2 = 25 \implies z = \pm \frac{5}{\sqrt{2}}.$$

Step 2: Solve for radius On either level,

$$x^2 + y^2 = z^2 = \frac{25}{2}.$$

Thus the intersection consists of two circles:

$$\boxed{z = \pm \frac{5}{\sqrt{2}}, \quad x^2 + y^2 = \frac{25}{2}}.$$

Each has radius $\boxed{5/\sqrt{2}}$. Both signs are essential because the cone is double. Substitution verifies both circles in both original equations.