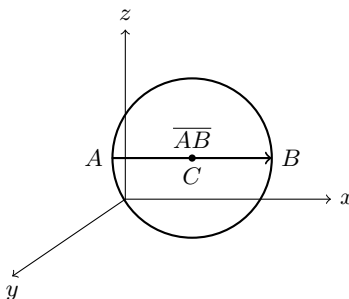


Question 2

The endpoints of a diameter of a sphere are $A = (-2, 1, 4)$ and $B = (6, -3, 0)$. Find the sphere's center, radius, and equation. Determine where the sphere intersects the z -axis.

Question 2 – Solution

Strategy The center is the midpoint of the diameter, and the radius is half its length. Points on the z -axis have the form $(0, 0, z)$.



Center and radius The midpoint is $C = (2, -1, 2)$. Also,

$$|AB| = \sqrt{8^2 + (-4)^2 + (-4)^2} = 4\sqrt{6}, \quad r = 2\sqrt{6}.$$

Therefore the sphere is

$$(x - 2)^2 + (y + 1)^2 + (z - 2)^2 = 24.$$

z -axis intersections Set $x = y = 0$: $4 + 1 + (z - 2)^2 = 24$, so $(z - 2)^2 = 19$. The intersection points are $(0, 0, 2 \pm \sqrt{19})$.

Verification Both A and B are $2\sqrt{6}$ units from C , and their midpoint is C .