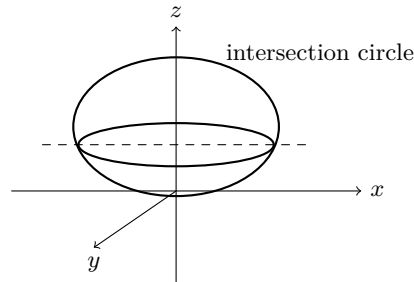


Question 9

Find and classify the curve of intersection of the sphere $x^2 + y^2 + z^2 = 25$ with the plane $x + 2y + 2z = 9$. Find the curve's center and radius, and determine whether the plane is tangent, secant, or disjoint.

Question 9 – Solution

Strategy The circle center is the perpendicular projection of the sphere center onto the plane.



Plane distance The origin-to-plane distance is $d = 9/\sqrt{1+4+4} = 3$. Since $3 < 5$, the plane is secant.

Center and radius The foot from the origin lies along $\langle 1, 2, 2 \rangle$ and is

$$C = \frac{9}{9} \langle 1, 2, 2 \rangle = \boxed{(1, 2, 2)}.$$

By the right triangle from sphere center to circle edge, $r^2 = 5^2 - 3^2 = 16$, so $\boxed{r = 4}$.

Classification The intersection is a circle in the given plane, centered at $(1, 2, 2)$ with radius 4.