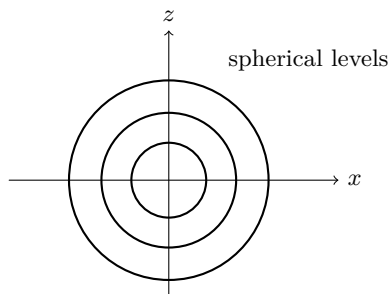


Question 8

For $F(x, y, z) = \sqrt{(x-1)^2 + (y+2)^2 + (z-3)^2}$, interpret F geometrically. Describe every level surface $F = c$, determine the range, and find the level surface through $(4, 2, 3)$.

Question 8 – Solution

Strategy Recognize the three-dimensional distance formula.



Interpretation F is distance from $C = (1, -2, 3)$, so its range is $[0, \infty)$.

Levels For $c > 0$, $F = c$ is the sphere

$$(x - 1)^2 + (y + 2)^2 + (z - 3)^2 = c^2.$$

For $c = 0$ it is the single point C ; for $c < 0$ it is empty.

Requested surface The point $(4, 2, 3)$ is distance $\sqrt{3^2 + 4^2} = 5$ from C , so its level surface is the sphere of radius 5 .