

Answer on Question #45081 – Math – Analytic Geometry

Task:

Find the equation of the cylinder with base curve

$$x^2 + y^2 + z^2 - 2x - 4z + 1 = 0, \quad 2x + y + z = 2$$

Solution:

The first equation is the sphere. Indeed,

$$x^2 - 2x + 1 - 1 + y^2 + z^2 - 4z + 4 - 4 + 1 = 0$$

$$(x - 1)^2 + y^2 + (z - 2)^2 = 4$$

And the last one is the plane.

We can find the equation of the cylinder by the substitution. From the equation

Second equation we have $z = 2 - 2x - y$. And from the second equation we get

$$x^2 + y^2 + (2 - 2x - y)^2 - 2x - 4(2 - 2x - y) + 1 = 0$$

$$x^2 + y^2 + 4 + 4x^2 + y^2 - 8x - 4y + 4xy - 2x - 8 + 8x + 4y + 1 = 0$$

$$5x^2 + 2y^2 + 4xy - 2x - 3 = 0$$

Answer: $5x^2 + 2y^2 + 4xy - 2x - 3 = 0$