Homework 3(first part)

1 Consider system of simultaneous equations $\begin{cases} ax + by + cz = d \\ x + 2y + 3z = 1 \end{cases}$
Find conditions on parameters a, b, c, d such that this system has no solutions.
Could this system have exactly one solution?

2 Write down an equation of the plane α such that α is orthogonal to the vector $\mathbf{N} = (1, 2, 3)$ and the point $A = (2, 3, 5)$ belongs to this plane.
Find the distance between this plane and the point $B = (1, 0, 0)$.

3 Write down an equation of the plane (standard and parametric) passing through the points $A = (x_1, y_1, z_1) = (1, 1, 1)$, $B = (x_2, y_2, z_2) = (1, 2, 3)$, $C = (x_3, y_3, z_3) = (2, 2, 0)$.

4[†] Find a line passing through the point $(1, 0, 0)$ such that all points of this line belong to the one-sheeted hyperboloid $x^2 + y^2 - z^2 = 1$.