Lecture 5: Parametric Equations

1 Equations of Lines in Space

From previous lecture, we see that a line can be represented as the intersection of two planes. However, as equations it is not so easy to use because we need to solve it first.
Another representation is to treat a line as the trajectory of a moving point, and include a parameter in the equation to describe different positions in the line. Such representation is called **parametric equations**.

Example 1. *Find the parametric equation of the line through* $Q_0 = (-1, 2, 2)$ *and* $Q_1 = (1, 3, -1)$.
Given that the line can be the trajectory of a moving point, the parameter in the equation could be the time t. *Suppose that at* $t = 0$, *the moving point is in* Q_0, *and at* $t = 1$, *the moving point is in* Q_1, *and suppose the point moves at a constant speed.*
The point $Q = (x, y, z)$ *in the line satisfies the following equation:*

$$\vec{Q_0Q} = t \cdot \vec{Q_0Q_1}$$

$$< x + 1, y - 2, z - 2 >= t \cdot < 2, 1, -3 >$$