Lines and Planes

In this notebook I follow the steps described in the book

No Bullshit guide to Linear Algebra , Ivan Savov

Starting with chapter 4 of that book geometrical aspects of linear algebra are discussed.

Points

A point in 3 D is represented by a set of three coordinate values $p_x,\ p_y,\ p_z$. Equivalently the point is represented by a vector $\mathbf{p}$.

$$\mathbf{p} = \begin{bmatrix} p_x \\ p_y \\ p_z \end{bmatrix}$$

Lines

There several ways a line in 3D can be expressed:

parametric equation

$$\begin{bmatrix} x \\ y \\ y \end{bmatrix} = \mathbf{p} + t \cdot \mathbf{v}$$

$-\infty < t < \infty$

Using the parametric equation of a line the *symmetric equation* is obtained:

symmetric equation

$$x = p_x + t \cdot v_x \tag{1}$$
$$y = p_y + t \cdot v_y \tag{2}$$
$$z = p_z + t \cdot v_z \tag{3}$$
$$\tag{4}$$
$$\frac{x - p_x}{v_x} = t \tag{5}$$
$$\frac{y - p_y}{v_y} = t \tag{6}$$
$$\frac{z - p_z}{v_z} = t \tag{7}$$
$$\tag{8}$$
$$\frac{x - p_x}{v_x} = \frac{y - p_y}{v_y} = \frac{z - p_z}{v_z} \tag{9}$$

Lines as intersection of planes

If two planes intersect the intersecting line is the set of values that are common to both planes. The planes only intersect if they are not parallel.

In [ ]: