Lines

If you have a line L that passes through point P_0 and is parallel to the vector $\vec{v}$ the equation for the line is:

$$r(t) = r_0 + t\vec{v}$$

Where r is the position vector of the point P that is on L and r_0 is the position vector of P_0.

Parametric Equations for a Line

The **standard parametrization** of the line L through the point $P_0(x_0, y_0, z_0)$ parallel to the vector $\mathbf{v} = v_1\mathbf{i} + v_2\mathbf{j} + v_3\mathbf{k}$ is given by

$$x(t) = x_0 + t\,v_1,\ y(t) = y_0 + t\,v_2,\ z(t) = z_0 + t\,v_3,\ \ -\infty < t < \infty$$

Distance from a Point to a Line

The distance from a point S to a line L which passes through a point P and is parallel to a vector v is,

$$d = \frac{||\vec{PS} \times v||}{||v||}$$