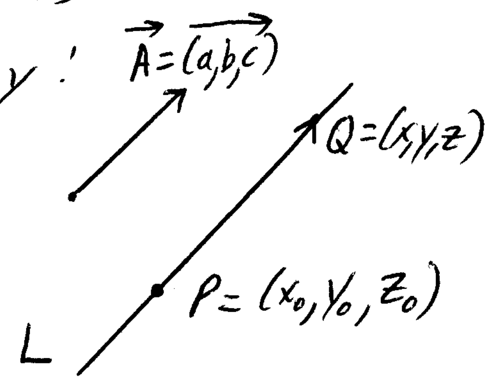
Math 21C
Vogler

Lines & Planes in 3D-space

<u>Defn</u> Let $P=(x_0,y_0,z_0)$ be a point in 3D-space & let $\vec{A}=\overrightarrow{(a,b,c)}$ be a vector. The <u>line L</u> passing through point P & parallel to $\vec{A}$ is the set of all points (x,y,z) <u>parametrically</u> by:

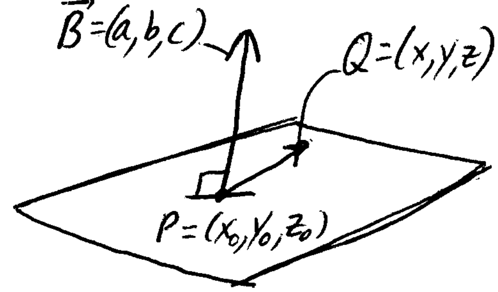
$$\text{Line } L: \begin{cases} x = x_0 + at \\ y = y_0 + bt \\ z = z_0 + ct \end{cases} \text{ for } -\infty < t < \infty$$



Note: If you let $\vec{r}=\overrightarrow{(x,y,z)}$ & $\vec{r}_0=\overrightarrow{(x_0,y_0,z_0)}$, you can write the line in <u>vector form</u>: $\vec{r}(t)=\vec{r}_0+\vec{A}t$, for $-\infty<t<\infty$

<u>Defn</u> Let $P=(x_0,y_0,z_0)$ be a point on a plane S & let $\vec{B}=\overrightarrow{(a,b,c)}$ be a vector perpendicular to the plane. The <u>plane S</u> is the set of all points (x,y,z) given by:

Plane S: $a(x-x_0)+b(y-y_0)+c(z-z_0)=0$



Note: The <u>standard form</u> for a plane S is

$ax+by+cz=D$ where $D=ax_0+by_0+cz_0$