Consider the line through the point \((x_0, y_0, z_0)\) and parallel to the non-zero vector \(\mathbf{v} = (a, b, c)\).

A point \((x, y, z)\) is on the line if and only if the displacement vector with initial point \((x_0, y_0, z_0)\) and final point \((x, y, z)\) is parallel to \(\mathbf{v}\). That is, \((x - x_0, y - y_0, z - z_0)\) must be a scalar multiple of \(\mathbf{v}\):

\[
(x - x_0, y - y_0, z - z_0) = t(a, b, c).
\]

Componentwise,

\[
\begin{align*}
  x - x_0 &= at \\
  y - y_0 &= bt \\
  z - z_0 &= ct.
\end{align*}
\]

Thus, we obtain the parametric equations

\[
\begin{align*}
  x &= x_0 + at \\
  y &= y_0 + bt \\
  z &= z_0 + ct.
\end{align*}
\]