## Exercise 25

Show that there are no points $(x, y, z)$ satisfying $2 x-3 y+z-2=0$ and lying on the line $\mathbf{v}=(2,-2,-1)+t(1,1,1)$.

## Solution

The parameterization for the line can be written as

$$
\begin{aligned}
\mathbf{v} & =(2,-2,-1)+t(1,1,1) \\
& =(2,-2,-1)+(t, t, t) \\
& =(2+t,-2+t,-1+t) .
\end{aligned}
$$

The $x$-, $y$-, and $z$-components of the line are

$$
x=2+t \quad \text { and } \quad y=-2+t \quad \text { and } \quad z=-1+t
$$

respectively. Substitute these into the equation for the plane.

$$
\begin{aligned}
2 x-3 y+z-2 & =2(2+t)-3(-2+t)+(-1+t)-2 \\
& =4+2 t+6-3 t-1+t-2 \\
& =7 \neq 0
\end{aligned}
$$

Since the right side is 7 for all values of $t$ and not 0 , there are no points $(x, y, z)$ on the line that lie in the plane.

