Example 3. Find symmetric equations for the line through $(2, -1, 1)$ and perpendicular to both $\vec{u} = \langle 1, 0, 1 \rangle$ and $\vec{v} = \langle -1, 1, 0 \rangle$.

5 Equations of a line in 3D are not unique

- We can use any point on the line as the starting point $P_0 = (x_0, y_0, z_0)$
- We can also use any vector parallel to the line as the direction vector $\vec{v} = \langle a, b, c \rangle$

Example 4. In Example 2, we considered a line that passes through the point $(2, 4, 3)$ and is parallel to the vector $\vec{i} - 2\vec{j} + 4\vec{k}$.

a. Using a different point, find another set of parametric equations for this line.
b. Using a different direction vector, find another set of parametric equations for this line.

a. $(3, 2, 7)$ is on the line

$\Rightarrow$ Another set of parametric eqs:

$x = 3 + t \quad y = 2 - 2t \quad z = 7 + 4t$

b. $-\vec{v} = \langle -1, 2, -4 \rangle$ is also parallel to the line

$\Rightarrow$ Another set of parametric eqs:

$x = 2 - t \quad y = 4 + 2t \quad z = 3 - 4t$