Line and Plane in Space

Ex 1.

Check if the line given parametrically

$$\ell: \ x = 1 + 2t, \, y = -1 + t, \, z = 3 - t$$

intersects the plane $\pi : 2x - y + z - 4 = 0$. If so, provide the intersection point.

Ex 2.

$\star$ Calculate the distance of point $G(2, -1,0)$ from the line passing through points $H(0,0,0)$ and $I(1,1,1)$.

Ex 3.

$\star$ Consider the system of a line and a plane dependent on parameter λ:

$$\ell(\lambda) : x = \lambda + t, \, y = 1 + 2t, \, z = 2 - t$$

and

$$\pi : x - (\lambda - 1)y + z - 3 = 0$$

Determine the values of λ for which the line is parallel to the plane, contained in the plane, or intersects it at a single point.