#8) Prove that the lines l_1 and l_2 intersect. Then find their point of intersection and the angle between them. (8pts)

$l_1 \Rightarrow x = -3t+1$
$y = 4t+1$
$z = 2t+4$

$l_2 \Rightarrow x = 3v+1$
$y = 2v-17$
$z = -v+1$

$-3t+1 = 3v+1$
$-3t-3v = 0$

$4t+1 = 2v-17$
$4t-2v = -18$

$2t+4 = -v+1$
$2t+v = -3$
$\cdot 2$
$4t+2v = -6$
$\cdot -2$
$-4t-2v = 6$

$4t-2v = -18$
$4t+2v = -6$
$8t = -24$
$\boxed{t=-3}$

$4t-2v = -18$
$-4t-2v = 6$
$-4v = -12$
$\boxed{v=3}$

$-3(-3)-3(3) = 0$
$9-9 = 0$ ✓ intersect

$-3(-3)+1 = 10$
$4(-3)+1 = -11$
$2(-3)+4 = -2$

$3(3)+1 = 10$
$2(3)-17 = -11$
$-3+1 = -2$

$\boxed{\langle 10, -11, -2 \rangle}$ Point of Intersection

$\vec{u} = \langle -3, 4, 2 \rangle$ $\vec{v} = \langle 3, 2, -1 \rangle$

$\vec{u} \cdot \vec{v} = -9+8+-2 = -3$

$\|\vec{u}\|$ $\sqrt{9+16+4} = \sqrt{29}$
$\|\vec{v}\|$ $\sqrt{9+4+1} = \sqrt{14}$

$\cos\theta = \dfrac{-3}{\sqrt{406}}$

$\theta = \cos^{-1} 3/\sqrt{406}$ $\boxed{\theta = 81.44^\circ}$