Name

Section

Math 2605D

Quiz 2 (15 minutes)

Given the plane $(\alpha): x+y+z=12$

and the line $\ell: \begin{cases} x=1+2t \\ y=2+4t \\ z=3+6t \end{cases}$

① Compute the distance from the point $P(1,2,3)$ to the plane (α).

② Find the point of intersection of (α) and ℓ.

③ Write the parametric equation for the reflecting line of ℓ via the plane (α).

Sol^n ① distance $= \dfrac{|1+2+3|}{\sqrt{1^2+1^2+1^2}} = 2\sqrt{3}$.

② We have $(1+2t)+(2+4t)+(3+6t)=12 \longrightarrow t=1/2$

$\Rightarrow$ Point of intersection is $(1+2\cdot\frac{1}{2}, 2+4\cdot\frac{1}{2}, 3+6\cdot\frac{1}{2}) = (2,4,6)$.

③ $d=(2,4,6)$

$n=(1,1,1) \Rightarrow u = \dfrac{n}{\|n\|} = \dfrac{1}{\sqrt{3}}(1,1,1)$ $\Big\} \Rightarrow u\cdot d = \dfrac{1}{\sqrt{3}}\cdot 12 = 4\sqrt{3}$

so $d' = d - 2(u\cdot d)u = (2,4,6) - 2\cdot 4\sqrt{3}\cdot\frac{1}{\sqrt{3}}(1,1,1) = (-6,-4,-2)$

$\Rightarrow \ell'$ is $\begin{cases} x=2-6t \\ y=4-4t \\ z=6-2t. \end{cases}$