Intersection of a line and a plane and of two planes and distance - Homework

1. Find the distance from the point A(-1,-3,5) and the plane $3x-4y+2z-18=0$. Does the point lie above or below the plane. Justify your reasoning. {0.19 units, A is above the plane}

2. Find the intersection of the line $\ell:(x,y,z)=(2,3,1)+t(-1,-2,3)$ and the plane $3x-4y+2z-18=0$ {(0,-1,7)}

3. Find the parametric equations of the line of intersection of the planes $\begin{aligned}\pi_1 &: 3x-y+z-8=0\\ \pi_2 &: x-2y+2z+5=0\end{aligned}$. $\left\{x=\frac{21}{5},\ y=\frac{23}{5}+t,\ z=t\right\}$

4. Find the distance from the point A(-1,2,-6) and the plane $x-2y-3z-7=0$. Does the point lie above or below the plane. Justify your reasoning. {1.6 units, A is below the plane}

5. Find the intersection of the line $\ell:(x,y,z)=(3,1,-1)+t(-2,-3,5)$ and the plane $2x+y-3z=-34$. {(-1,-5,9)}

6. Find the parametric equations of the line of intersection of the planes $\begin{aligned}\pi_1 &: 2x-y+5z-15=0\\ \pi_2 &: 3x-2y-z+4=0\end{aligned}$.

   Show that the direction vector for the line of intersection is a scalar multiple of the cross product of the normals for the two planes. $\left\{x=t,\ y=\frac{5}{11}+\frac{17}{11}t,\ z=\frac{34}{11}-\frac{1}{11}t\right\}$

7. Two planes, π_1 and π_2, intersect in the line with symmetric equation $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z+4}{1}$. Plane π_1 contains the point A(2,1,1) and plane π_2 contains the point B(1,2,-1). Find the scalar equations of planes π_1 and π_2. $\{\pi_1: 16x-9y-5z-18=0,\quad \pi_2: 3x-2y+1=0\}$

8. Find the distance between the line $\ell:(x,y,z)=(-1,2,2)+t(1,-2,5)$ and the plane $\pi: x+3y+z-12=0$

9. Find the distance between the parallel planes $\begin{aligned}\pi_1 &: 3x-4y-z+15=0\\ \pi_2 &: 3x-4y-z-3=0\end{aligned}$

10. Find the intersection of the line $\ell:\frac{x-2}{2}=\frac{y-1}{3}=\frac{z+1}{4}$ and the plane $x-2y+3z-2=0$.

11. Find the intersection of the line $\ell:\begin{cases}x=2-3k\\ y=-5-7k\\ z=3+2k\end{cases}$ and the plane $3x-y+z-14=0$.

12. Find the intersection of the line $\ell:\begin{cases}x=1-t\\ y=2+t\\ z=3-2t\end{cases}$ and the plane $x-y-z-7=0$.