Math 20 - Spring 2002

Homework #14 Solutions

$\boxed{\text{Total: 12pts}}$

3.5/# 1a, 2a, 4b, 5b, 6b, 7a, 8b, 9ab, 10a, 11a, 14a, 17, 25, 29, 33, 39.

1a. (0.5pts) $P(-1,3,-2)$, $\vec{n}=(-2,1,-1)$

$\vec{n}\cdot(x+1, y-3, z+2)=0 \Rightarrow \boxed{-2(x+1)+(y-3)-(z+2)=0}$

2a. (0.5pts) $-2(x+1)+(y+3)-(z+2)=0 \Rightarrow -2x-2+y-3-z-2=0$

$\Rightarrow \boxed{-2x+y-z-7=0}$

4b. (1pt) $P(5,4,3)$ $Q(4,3,1)$ $R(1,5,4)$.

Note that $\vec{PQ}\times\vec{PR}$ is a normal to the plane that encompasses P, Q, R.

$\vec{PQ}=(-1,-1,-2)$

$\vec{PR}=(-4,1,1)$. $\Rightarrow$ $\vec{PQ}\times\vec{PR}=(1,9,-5)\equiv\vec{n}$.

Choose a point, say P and apply point-normal form.

$\vec{n}\cdot(x-5, y-4, z-3)=0 \Rightarrow (x-5)+9(y-4)-5(z-3)=0$

$\Rightarrow \boxed{x+9y-5z-26=0}$

5b. (0.5pts) S_1: $x-4y-3z-2=0$

S_2: $3x-12y-9z-7=0$.

S_1 and S_2 are parallel if their normal vectors are parallel. Since $\vec{n_2}=(3,-12,-9)=3(1,-4,-3)=3\vec{n_1}$

$\Rightarrow \vec{n_1}$ and $\vec{n_2}$ are parallel $\Rightarrow$ $\boxed{S_1 \text{ and } S_2 \text{ are parallel}}$

6b. (0.5pts) line: $\begin{cases} x=3t \\ y=1+2t \\ z=2-t \end{cases}$

plane: $4x-y+2z=1$

If the line and plane are parallel, the direction vector of the line $(3,2,-1)$ must be perpendicular to the normal of the plane $(4,-1,2)$:

$(3,2,-1)\cdot(4,-1,2)=8\neq 0$

$\boxed{\text{line and plane are } \underline{\text{not}} \text{ parallel}}$