Name: Solutions

1. Show that the point $P(1, 2, 3)$ lies on the plane defined by $2x + 3y - z = 5$.

$$2 \cdot 1 + 3 \cdot 2 - 3 = 2 + 6 - 3 = 5 \checkmark$$

2. Find the "parametric equation" of the line that passes through $P(1, 2, 3)$ and is perpendicular to the plane from problem 1.

Normal to plane: $\langle 2, 3, -1 \rangle$

Line:

$$\langle 1, 2, 3 \rangle + t \langle 2, 3, -1 \rangle$$

$$= \boxed{\langle 1 + 2t, 2 + 3t, 3 - t \rangle}$$

3. Find a vector perpendicular to the vectors $\mathbf{v} = \langle 1, 2, 1\rangle$ and $\mathbf{w} = \langle 3, 1, 1\rangle$.

$$\vec{v} \times \vec{w} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 2 & 1 \\ 3 & 1 & 1 \end{vmatrix} = (2-1)\hat{i} - ((1-3))\hat{j} + (1-6)\hat{k}$$

$$= \boxed{\hat{i} + 2\hat{j} - 5\hat{k}}$$

4. Find the equation of a plane that passes through the points $O(0, 0, 0)$, $P(1, 2, 1)$ and $Q(3, 1, 1)$.

$\overrightarrow{OP} = \langle 1, 2, 1\rangle$

$\overrightarrow{OQ} = \langle 3, 1, 1\rangle$

$\overrightarrow{OP} \times \overrightarrow{OQ} = \langle 1, 2, -5\rangle$ from problem 3.

Plane: $1\cdot x + 2\cdot y - 5z = 0$ ← plane thru origin

5. Find the equation of a plane that is parallel to the plane you found in problem 4 but that passes through the point $R(5, 1, 0)$.

Same normal, different point.

$$\boxed{1\cdot(x-5) + 2(y-1) - 5(z-0) = 0}$$