Lines and Planes

1. Find an equation describing the plane which passes through the points $(2, 2, 1)$, $(3, 1, 0)$, and $(0, -2, 1)$.

2. Find an equation describing the plane which goes through the point $(1, 3, 5)$ and is perpendicular to the vector $\langle 2, 1, -3 \rangle$.

3. Let L be the line which passes through the points $(1, -2, 3)$ and $(4, -5, 6)$.

   (a) Find a parametric vector equation for L.

   (b) Find parametric (scalar) equations for L.

   (c) Find symmetric equations for L.

4. Let L_1 be the line with parametric vector equation $\vec{r}_1(t) = \langle 7, 1, 3\rangle + t\langle 1, 0, -1\rangle$ and L_2 be the line described parametrically by $x = 5, y = 1 + 3t$, $z = t$. How many planes are there which contain L_2 and are parallel to L_1? Find an equation describing one such plane.

5. Find the distance from the point $(0, 1, 1)$ to the plane $2x + 3y + 4z = 15$.

6. Find the distance from the point $(1, 3, -2)$ to the line $\frac{x}{3} = y - 1 = z + 2$.

7. True or false: The line $x = 2t$, $y = 1 + 3t$, $z = 2 + 4t$ is parallel to the plane $x - 2y + z = 7$.

8. True or false: Let S be a plane normal to the vector $\vec{n}$, and let P and Q be points not on the plane S. If $\vec{n} \cdot \overrightarrow{PQ} = 0$, then P and Q lie on the same side of S.