Math 203 Solution
Quiz 2 19 September 2002

1. Write a set of parametric equations for the line through the point $(2,3,5)$ and perpendicular to the plane $x - 2z = 7$.

   Solution: The direction vector is $\langle 1, 0, -2\rangle$ and the point $(2,3,5)$ lies on the line. The parametric equations are

$$\begin{aligned} x &= 2 + t \\ y &= 3 \\ z &= 5 - 2t. \end{aligned}$$

2. Find an equation for the plane containing the origin and the points $(1,4,7)$ and $(-3,-1,2)$.

   Solution: Let $\vec{n}$ denote a normal vector to the plane. Then we may take

$$\vec{n} = \langle 1,4,7\rangle \times \langle -3,-1,2\rangle = \begin{vmatrix} \vec{\imath} & \vec{\jmath} & \vec{k} \\ 1 & 4 & 7 \\ -3 & -1 & 2 \end{vmatrix} = \langle 15, -23, 11\rangle.$$

   An equation for the plane is

$$15x - 23y + 11z = 0.$$

3. Let L be the line given by $\vec{r}(t) = (2+3t)\vec{\imath} + (1-t)\vec{\jmath} + (6-2t)\vec{k}$ and P be the plane $3x + 4y - z + 3 = 0$. Find the point of intersection of L and P.

   Solution: We need to solve

$$\begin{aligned} 0 &= 3(2+3t) + 4(1-t) - (6-2t) + 3 \\ &= 7 + 7t \end{aligned}$$

   for t. The solution is $t = -1$, so the point of intersection is

$$\vec{r}(-1) = (-1, 2, 8).$$