Quiz 7

Name: key

[6] **1.** Find an equation for the plane containing the point $P(1,2,0)$ and perpendicular to the line $x = 2t$, $y = 1+t$, $z = 4+3t$.

The vector $\langle 2,1,3\rangle$ is parallel to the line, (2) and so is perpendicular to the plane. (2)

So an equation for the plane is

$$2(x-1) + 1\cdot(y-2) + 3\cdot(z-0) = 0 \quad (2)$$

or

$$2x + y + 3z = 4$$

[6] **2.** Find symmetric equations of the line through the points $P(4,1,3)$ and $Q(2,-1,5)$.

A vector parallel to the line is

$$\vec{v} = \overrightarrow{PQ} = \langle 2-4, -1-1, 5-3\rangle = \langle -2,-2,2\rangle. \quad (2)$$

So symmetric equations for the line (using P) are

$$\frac{x-4}{-2} = \frac{y-1}{-2} = \frac{z-3}{2} \quad (4)$$

(another form is $4-x = 1-y = z-3$).

[8] **3.** Find the point at which the line $x-1 = y = \dfrac{z}{2}$ intersects the plane $x+y+z=21$.

Solving the equations of the line for y and z as functions of x gives: $\begin{cases} y = x-1 \\ z = 2x-2 \end{cases}$. (2)

(2) The point of intersection must satisfy these two equations as well as the equation of the plane $x+y+z=21$. Substituting for y and z from above, we get $x + (x-1) + (2x-2) = 21$, or $4x = 24$, so $x = 6$. (2)

Then the equations for the line give $y = 5$ and $z = 10$.

Hence the point is $(6,5,10)$. (2)