Math 201 Quiz 3 26/06/2013

Ex1. Find an equation for the plane that passes through $(1,2,3)$ and parallel to both $u = 2i+3j+k$ and $v = i-j+2k$

Solution. The vector $u \times v$ is normal to the plane

$$u \times v = -2k - 4j - 3k + 6i + j + i = 7i - 3j - 5k$$

An equation of the plane is given by:

$$7(x-1) - 3(y-2) - 5(z-3) = 0$$

or $7x - 3y - 5z = -14$

Ex2. Find parametric equations for the line in which the planes $x+2y+z=1$ and $x-y+2z=-8$ intersect

Solution: Let $P(x,y,z)$ be a random point in the line of intersection of the two plane. Then the coordinates of P must verify:

$$\begin{cases} x + 2y + z = 1 \quad (1) \\ \text{and} \\ x - y + 2z = -8 \quad (2) \end{cases}$$

(2) implies: $y = x + 2z + 8$. Substituting the latter in (1) implies:

$$x + 2(x+2z+8) + z = 3x + 5z + 16 = 1$$

i.e $3x = -15 - 5z$ i.e $x = -5 - \frac{5}{3}z$.

Thus:

$$y = x + 2z + 8 = -5 - \frac{5}{3}z + 2z + 8 = 3 - \frac{1}{3}z.$$

Therefore parametric equations of the line can be:

$$x = -5 - \frac{5}{3}t, \quad y = 3 - \frac{1}{3}t, \quad z = t \text{ with } t \in \mathbb{R}.$$