P 158

[1] $P_0(2,4,5)$, $\vec{n} = \langle 3,-1,-2 \rangle$

α: $3(x-2) - (y-4) - 2(z-5) = 0$

[2] $A(3,2,5)$, $B(4,-2,1)$. α through A, perp to $\overrightarrow{AB}$.

$\overrightarrow{AB} = \langle 1,-4,-4 \rangle$.

α: $(x-3) - 4(y-2) - (z-5) = 0$

[3] α through $(-5,-2,3)$ // xy-plane

β through $(-5,-2,3)$ // yz-plane

α: $(x+5) + (y+2) + z = 0$, $z \in \mathbb{R}$

β: $x + (y+2) + (z-3) = 0$, $x \in \mathbb{R}$

P159 ctd

[4] Plane through origin perpendicular to $\langle a, b, c \rangle$.

[5] $A(0,0,0)$, $B(1,0,-1)$, $C(0,2,3)$

$$\begin{matrix} A: \\ B: \\ C: \end{matrix} \begin{bmatrix} d = 0 \\ a - c + d = 0 \\ 2b + 3c = 0 \end{bmatrix} \Rightarrow \begin{matrix} c = t \\ a = t \\ b = \frac{-3t}{2} \end{matrix} \quad , \; t \in \mathbb{R}$$

Then,

$$tx - \frac{3t}{2}y + tz = 0$$

$$\therefore \quad 2x - 3y + 2z = 0$$

check

A: $2 \cdot 0 - 3 \cdot 0 + 2 \cdot 0 = 0$ ✓

B: $2(1) - 3(0) + 2(-1) = 0$ ✓

C: $2(0) - 3(2) + 2(3) = 0$ ✓

P 160

[6] $(2, 0, -4)$ and $\beta \parallel 3x + 4y - z = 5$

$$3x + 4y - z - 5 = 0$$

$$(3x - 5) + 4(y - 0) - (z - 0) = 0$$

$$3\left(x - \frac{5}{3}\right) + 4(y - 0) - (z - 0) = 0$$

$$\vec{n} = \langle 3, 4, -1 \rangle$$

$$\therefore \quad 3(x - 2) - 4(y - 0) - (z + 4) = 0$$

$$3x - 4y - z - 6 - 4 = 0$$

$$\therefore \quad 3x - 4y - z - 10 = 0$$