PLANES

Sketch the following planes. State the normal, all intercepts, the equations of all traces.

(1) $2x + 6y + 4z = 12$ (2) $10x + 5y + 15z = 30$

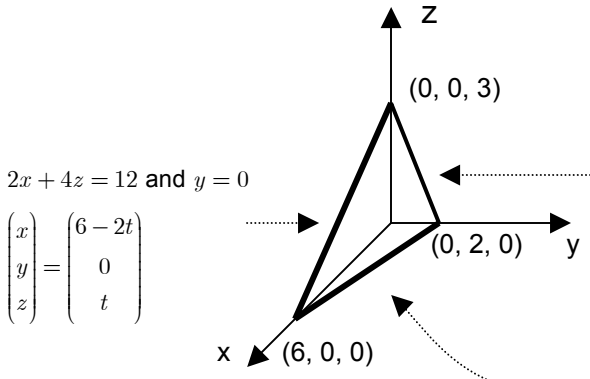
(3) $4x + 3y = 12$ (4) $5x + 3z = 15$

(5) $7y + 2z = 14$; (6) $z = 2$; (7) $y = 1$; (8) $x = 3$

Answers:

(1)

$\vec{n} = (1, 3, 2)$



$2x + 4z = 12$ and $y = 0$

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 6 - 2t \\ 0 \\ t \end{pmatrix}$$

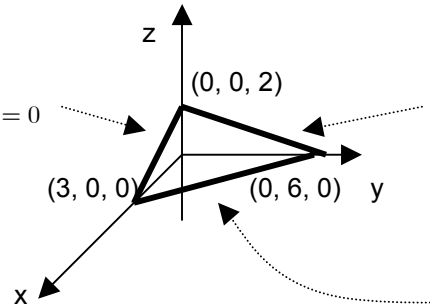
$6y + 4z = 12$ and $x = 0$

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 0 \\ 2 - \frac{2}{3}t \\ t \end{pmatrix}$$

$2x + 6y = 12$ and $z = 0$

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 6 - 3t \\ t \\ 0 \end{pmatrix}$$

(2) $\vec{n} = (2, 1, 3)$



$10x + 15z = 30$ and $y = 0$

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 3 - \frac{3}{2}t \\ 0 \\ t \end{pmatrix}$$

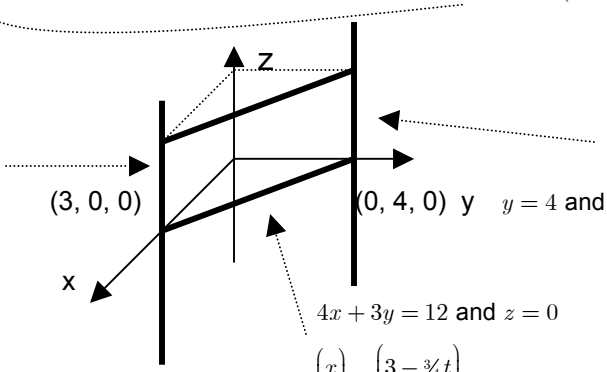
$5y + 15z = 30$ and $x = 0$

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 0 \\ 6 - 3t \\ t \end{pmatrix}$$

$10x + 5y = 30$ and $z = 0$

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 3 - \frac{1}{2}t \\ t \\ 0 \end{pmatrix}$$

(3) $\vec{n} = (4, 3, 0)$ plane parallel to z-axis



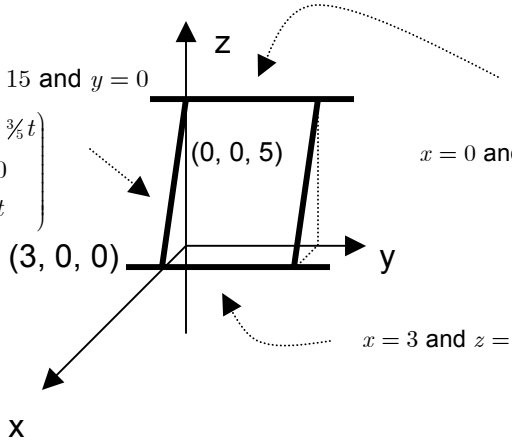
$x = 3$ and $y = 0 \rightarrow \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 3 \\ 0 \\ t \end{pmatrix}$

$y = 4$ and $x = 0 \rightarrow \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 0 \\ 4 \\ t \end{pmatrix}$

$4x + 3y = 12$ and $z = 0$

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 3 - \frac{3}{4}t \\ t \\ 0 \end{pmatrix}$$

(4) $\vec{n} = (5, 0, 3)$ plane parallel to y-axis



$5x + 3z = 15$ and $y = 0$

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 3 - \frac{3}{5}t \\ 0 \\ t \end{pmatrix}$$

$x = 0$ and $z = 5 \rightarrow \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 0 \\ t \\ 5 \end{pmatrix}$

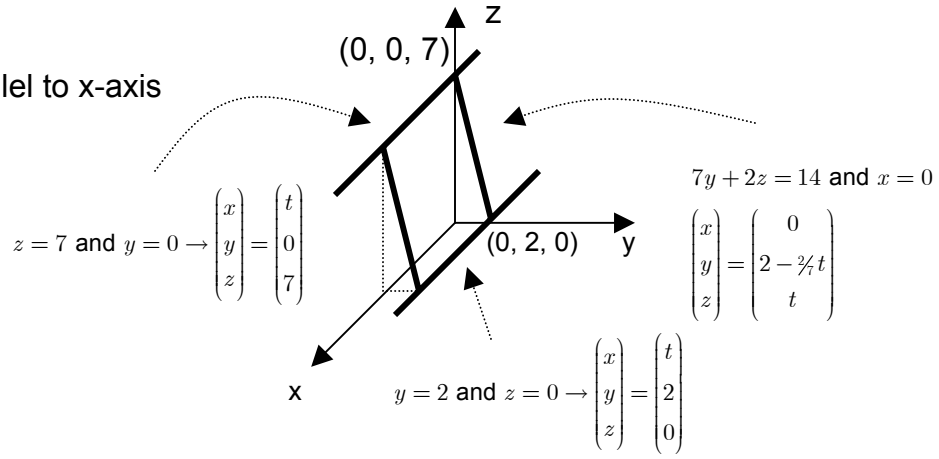
$x = 3$ and $z = 0 \rightarrow \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 3 \\ t \\ 0 \end{pmatrix}$

PLANES

Answers:

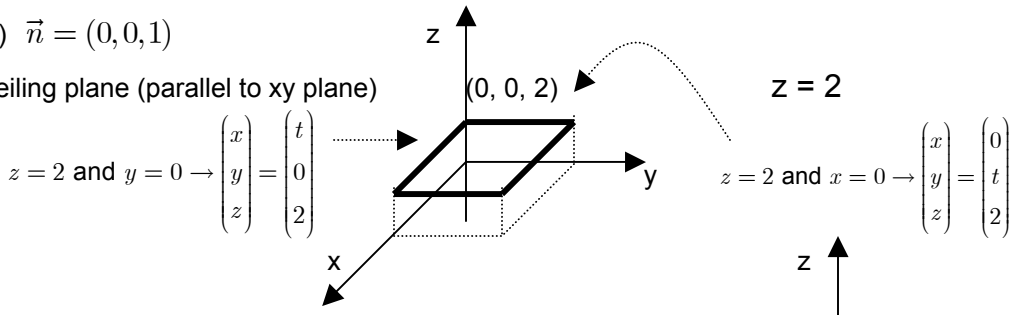
(5) plane parallel to x-axis

$\vec{n} = (0,7,2)$

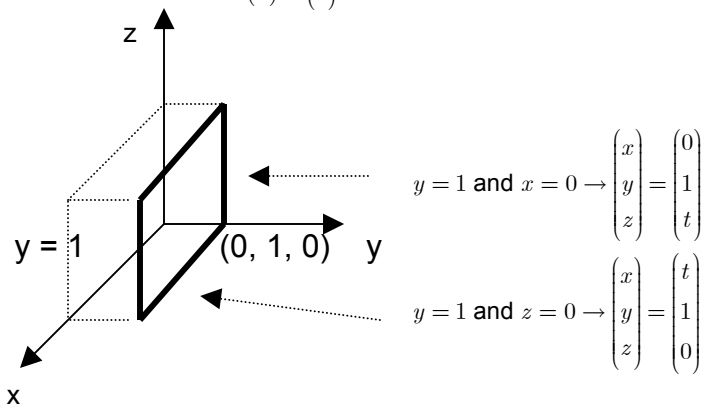


(6) $\vec{n} = (0,0,1)$

ceiling plane (parallel to xy plane)



(7) $\vec{n} = (0,1,0)$ plane parallel to side wall (xz plane)



(8) $\vec{n} = (1,0,0)$ plane parallel to front wall (yz plane)