Review

2017 B: B3 c) suppose there was no a) and b).

P1: $\vec{x} = \vec{0} + s_1\vec{a} + s_2\vec{b}$ (parametric form)

P2: $\vec{x} = t_1\vec{c} + t_2\vec{v}$

Want: $s_1\vec{a} + s_2\vec{b} = t_1\vec{c} + t_2\vec{v}$ (sol'n pts on both)

$$s_1\vec{a} + s_2\vec{b} - t_1\vec{c} - t_2\vec{v} = \vec{0}$$

~~Cols~~ vectors as cols:

$$\begin{bmatrix} 1 & 1 & -0 & -6 \\ 2 & -1 & -2 & -2 \\ 3 & 0 & +1 & -10 \end{bmatrix} \begin{bmatrix} s_1 \\ s_2 \\ +t_1 \\ +t_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$$\left[\begin{array}{cccc|c} 1 & 1 & 0 & -6 & 0 \\ 2 & -1 & -2 & -2 & 0 \\ 3 & 0 & +1 & -10 & 0 \end{array}\right] \rightarrow \text{GE}$$

What if $\vec{c} = 2\vec{a}$ and $\vec{v} = \vec{a} + 3\vec{b}$?

~~Planes the~~ planes are the same. $\Rightarrow$ sol'n is plane not line

What if planes parallel but not same?

$$\begin{bmatrix} \vec{a} & \vec{b} & \vec{c} & \vec{v} \end{bmatrix} \begin{bmatrix} s_1 \\ s_2 \\ -t_1 \\ -t_2 \end{bmatrix} = \begin{bmatrix} \vec{x} \end{bmatrix} = \text{eg} \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}$$

no sol'ns

Alt: $\vec{n}_1 = \vec{a} \times \vec{b}$ $\quad \vec{n}_2 = \vec{c} \times \vec{v}$

P1: $\vec{n}_1 \cdot (\vec{x} - \vec{0}) = 0$ $\quad$ P2: $\vec{n}_2 \cdot \vec{x} = 0$

$3x + 3y - 3z = 0$ $\quad \square x + \square y + \square z = 0$

$$\left[\begin{array}{ccc|c} 3 & 3 & -3 & 0 \\ \square & \square & \square & 0 \end{array}\right]$$

GE $\sim$ $\left[\quad\right]$

Alt: cross $(\vec{n}_1, \vec{n}_2)$??

$\vec{q}$, where $\vec{q} = 0$

PP #6 $\quad$ Recall $\vec{n} \cdot \vec{x} = d$ ← plane

$\vec{x} = \vec{q} + t\vec{a}$ ← explicit param form for line

$\vec{n} \cdot (\vec{q} + t\vec{a}) = d$, solve for t

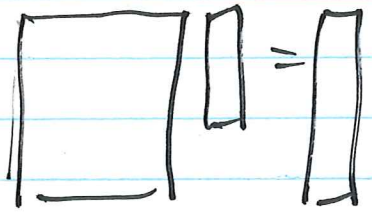
$1 + t(0) = d = 2$

$\times$ $\quad$ no such t

no intersection

b/c normal to the plane is orthog to the line: $\vec{n} \cdot \vec{a} = 0$

2017 B, #A6



a) no soln's

true

$x_1 = 42$

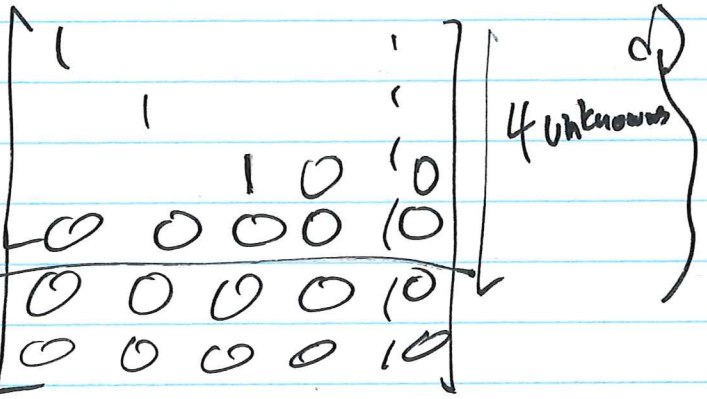
$x_1 = 43$

b) 1st six equations had unique soln. and then eq 7 and eq 8 were same as eq 6.

true

c) inf / 1 / none

false



d) yes

e) have 3 free vars.

$\vec{q} + s_1\vec{a} + s_2\vec{b} + s_3\vec{c}$

3 pivots and 3 free variables

2015 A, #6

$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \vec{x} = \vec{\xi} + s\vec{a} + t\vec{b}$ → $\begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix}$ → $\begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$ → $\begin{pmatrix} 1 \\ 5 \\ 0 \end{pmatrix}$

$\vec{n} = \vec{a} \times \vec{b}$

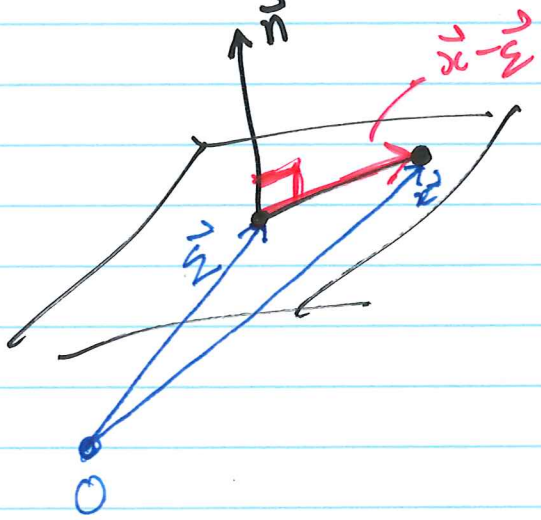
$\vec{n} \cdot (\vec{x} - \vec{\xi}) = 0$ eqn form of plane.

$\begin{pmatrix} 0 \\ 0 \\ 5 \end{pmatrix}$

$0 + 0 + 5(z+2) = 0$

~~$z = -2$~~

why?

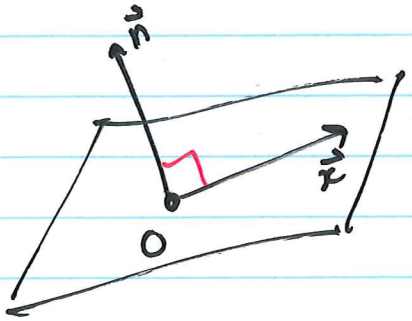


$\vec{n} \cdot \vec{x} - \vec{n} \cdot \vec{\xi} = 0$

$\vec{n} \cdot \vec{x} = \vec{n} \cdot \vec{\xi}$

$\vec{n} \cdot \vec{x} = d$

If plane includes origin, $\vec{\xi} = \vec{0}$



$\vec{n} \cdot \vec{x} = 0$

(x, y, z) any point on plane.