Assignment 1

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1 PROBLEM

Find the equation of the plane passing through the line of intersection of the planes $\begin{pmatrix} 1, 1, 1 \end{pmatrix}x = 1$ and $\begin{pmatrix} 2, 3, -1 \end{pmatrix}x$ = -4 and parallel to the x-axis.

2 EXPLANATION

We can write plane $\begin{pmatrix} 1, 1, 1 \end{pmatrix}x = 1$ as

$$x+y+z= 1 \qquad (2.0.1)$$

and $\begin{pmatrix} 2, 3, -1 \end{pmatrix}x$ = -4 as

$$2x + 3y - z = -4 \qquad (2.0.2)$$

From the first equation:

$$z = 1 - x - y \qquad (2.0.3)$$

From the second equation:

$$z = 2x + 3y + 4 \qquad (2.0.4)$$

So, $1 - x - y = 2x + 3y + 4$

$$y = -\frac{3x + 3}{4} \qquad (2.0.5)$$

Putting y's value in 2.0.3 we get

$$z = \frac{7 - x}{4} \qquad (2.0.6)$$

We can generalize the intersection line as $x = t$, $y = -\frac{3t+3}{4}$, $z = \frac{7-t}{4}$

The equation of the plane passing through

the line of intersection of the above two planes can be written as:

$$(1 + 2\lambda)x + (1 + 3\lambda)y + (1 - \lambda) = (1 - 4\lambda) \qquad (2.0.7)$$

Now, according to the problem statement the plane is parallel to the X-axis.

So, the equation should be like

$$by + cz = d \qquad (2.0.8)$$

Hence,

$$(1 - 2\lambda) = 0$$

$$\lambda = -\frac{1}{2} \qquad (2.0.9)$$

Putting $\lambda = -\frac{1}{2}$ in equation 2.0.7,

$$-\frac{1}{2}y + \frac{3}{2}z = 3 \qquad (2.0.10)$$

3 RESULT

Plot of plane obtained from Python code is shown below. Here the final plane 2.0.10 (red color) passing through the line of intersection of the plane 2.0.1 (green color) and plane 2.0.2 (blue color) and which actually is parallel to the X-axis.
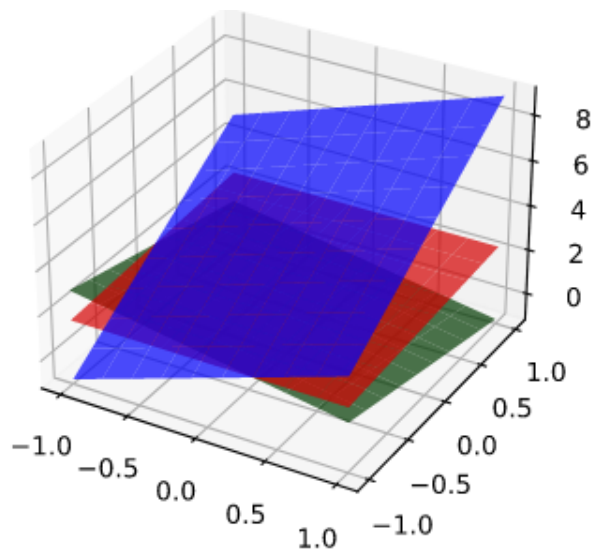
Fig. 0: Plot of the planes