Solution to Quiz 2

Dr Holmes
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Find an equation in the form $ax + by + cz = d$ for the plane passing through the points $(0,3,1), (1,1,2), (3,0,-5)$.

**Solution** You need to find two vectors lying in this plane and compute the cross product to get the normal vector.

I computed the vector from $(0,3,1)$ to $(1,1,2)$, which is $\langle 1, -2, 1 \rangle$ and the vector from $(1,1,2)$ to $(3,0,-5)$, which is $\langle 2, -1, -7 \rangle$

$$
\begin{array}{ccc|ccc}
    i & j & k & i & j \\
    1 & -2 & 1 & 1 & -2 \\
    2 & -1 & -7 & 2 & -1 \\
\end{array}
$$

The cross product is

$$(14 - -1)i + (2 - -7)j + (-1 - -4)k = 15i + 9j + 3k$$

The equation is then of the form

$$15x + 9y + 3z = ???$$

We can find out what $???$ stands for by plugging in the $x, y, z$ values from any one of the points given in the problem. In fact, given time we should plug in all of them to check that we do have the right equation.

$$15(0) + 9(3) + 3(1) = 30$$

so the answer is

$$15x + 9y + 3z = 30$$

and since

$$15(1) + 9(1) + 3(2) = 15(3) + 9(0) + 3(-5) = 30$$

as well, it checks out.