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1. Find an equation of the plane that passes through the points $(0, 1, 1)$, $(1, 0, 1)$, $(1, 1, 0)$.

$P \qquad Q \qquad R$

$PQ = Q - P = (1, 0, 1) - (0, 1, 1) = (1, -1, 0)$

$PR = R - P = (1, 1, 0) - (0, 1, 1) = (1, 0, -1)$

$PQ \times PR = \begin{array}{ccc} i & j & k \\ 1 & -1 & 0 \\ 1 & 0 & -1 \end{array} = i \begin{vmatrix} -1 & 0 \\ 0 & -1 \end{vmatrix} + j \begin{vmatrix} 1 & 0 \\ 1 & -1 \end{vmatrix} + k \begin{vmatrix} 1 & -1 \\ 1 & 0 \end{vmatrix}$

$= (1 - 0)i + (-1 - 1)j + (0 + 1)k$

$PQ \times PR = i - 2j + k$

$(x - 0) - 2(y - 1) + (z - 1) = 0 \qquad \boxed{x - 2y + z = -1}$

$x - 2y + 2 + z - 1 = 0$

2. Find the intersection of the line

$$\mathbf{r}(t) = \langle 1, 1, 0 \rangle + t\langle 0, 2, 4 \rangle$$

and the plane

$$x + y + z = 14 \quad.$$

$r(t) = (1, 1, 0) + (0, 2t + 4t)$

$r(t) = (1, 2t + 1, 4t)$

$x = 1$

$y = 2t + 1$

$z = 4t$

$x + y + z = 14$

$1 + (2t + 1) + 4t = 14$

$6t + 2 = 14$

$6t = 12$

$t = 2$

$\boxed{(1, 5, 8)}$