1. Find a parametric equation for the line through (4,-1,2) and (1,1,5).
   \[ \text{Point: } P_0(4, -1, 2) \quad \text{Vector: } \mathbf{a} = \langle 1-4, 1-(-1), 5-2 \rangle = \langle -3, 2, 3 \rangle \]
   \[ \text{Equation: } x = 4 - 3t \quad y = -1 + 2t \quad z = 2 + 3t \]

2. Find an equation for the plane through (3,-1,1), (4,0,2) and (6,3,1).
   \[ \text{Two vectors on the plane: } \langle 4-3, 0-(-1), 2-1 \rangle = \langle 1, 1, 1 \rangle \]
   \[ \langle 6-3, 3-(-1), 1-1 \rangle = \langle 3, 4, 0 \rangle \]
   \[ \text{Normal vector } \mathbf{n} = \left| \begin{array}{ccc} 1 & 1 & 1 \\ 3 & 4 & 0 \end{array} \right| = -4i + 3j + k \]
   \[ \text{Equation: } -4(x-3) + 3(y+1) + 1(z-1) = 0 \]

3. Determine whether the lines \( \frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} \) and \( \frac{x+1}{4} = \frac{y-3}{6} = \frac{z+5}{8} \) are parallel. Why?
   Yes. Because the vector of 1st line is \( \langle 2, 3, 4 \rangle \) and the vector of 2nd line is \( \langle 4, 6, 8 \rangle \), and \( \langle 4, 6, 8 \rangle = 2 \langle 2, 3, 4 \rangle \)

4. Determine whether the planes \( x+y-z=1 \) and \( 2x+2y-2=5 \) are perpendicular. Why?
   No. Because the normal vector of 1st plane is \( \langle 1, 1, -1 \rangle \) and the normal vector of 2nd plane is \( \langle 2, 2, -2 \rangle \), and \( \langle 1, 1, -1 \rangle \cdot \langle 2, 2, -2 \rangle = 2 + 2 + 2 = 6 \neq 0 \).