## Math 53 Discussion

**Practice Problems**: Equation of a line (parametric and symmetric), normal to a plane, intersections of two planes, equation of a plane (given three points on the plane, given a point and a line on the plane)

1) Find the parametric and symmetric equations for the line through the points $(0, \frac{1}{2}, 1)$ and $(2, 1, -3)$.

2) Find the equation of a plane through the points $(0, 1, 1)$, $(1, 0, 1)$, and $(1, 1, 0)$. (*Find two vectors lying on the plane and take their cross product to get a normal. Then use that, if* $P_0(x_0, y_0, z_0)$ *is a point on the plane and we have a normal* $\overrightarrow{n} = \langle a, b, c\rangle$, *all points* $P(x, y, z)$ *on the plane must satisfy* $\overrightarrow{PP_0} \cdot \overrightarrow{n} = 0$ *by definition of the normal being perpendicular to the plane.*)

Over for questions 3) and 4) →

3) Find the distance between the skew lines with parametric equations

$$x = 1 + t, y = 1 + 6t, z = 2t$$

$$x = 1 + 2s, y = 5 + 15s, z = -2 + 6s$$

(*Hint: skew lines lie on parallel planes. Skew means they aren't parallel lines but they never intersect. So you can think of these lines lying on two floors of a house. You want to find the distance between the two floors, i.e. the vertical distance from a point on the second floor to the plane of the first floor.*)

4 - harder) Find the equation of the plane containing the following point and line: the point is $(-1, 2, 1)$ and the line is given by the intersection of the planes $x+y-z = 2$ and $2x-y+3z = 1$. (*Hint: To find a plane containing the point and line, we need to get a normal vector. To get a normal, we need to take a cross product of two vectors lying in the plane. You can take one of these vectors to be the direction of the line of intersection. The other vector could be the vector from our distinguished point* $(-1, 2, 1)$ *to some point of your choosing on the line of intersection.*)