LB 220, Sections 001 & 002, Fall 2015
Homework 2 (due 9/18)

Instructions: Please write your solutions to the problems below on a clean piece of paper (not this piece of paper). You will not need more than one page (front and back) to write your answers. Show the steps taken to arrive at each answer. Do not include scratch work, doodles, scribbles, crossed out work, etc.; instead, carefully write your solutions after you have figured out the answers and checked them over.

1. Determine an equation for the plane in $\mathbb{R}^3$ which contains point $P(1, 2, 3)$ and the line given by the parametric equations

$$x = t, \quad y = 1 - t, \quad z = 2t, \quad -\infty < t < \infty.$$

2. Suppose that $\mathcal{P}_1$ and $\mathcal{P}_2$ are two non-parallel planes in $\mathbb{R}^3$. Let $\mathbf{n}_1$ be a nonzero normal vector to $\mathcal{P}_1$, and let $\mathbf{n}_2$ be a nonzero normal vector to $\mathcal{P}_2$. The *dihedral angle* between $\mathcal{P}_1$ and $\mathcal{P}_2$ is defined to be the angle, $\theta \in (0, \pi)$, between the normal vectors, $\mathbf{n}_1$ and $\mathbf{n}_2$.

   Determine the dihedral angle between a pair of incident faces of a regular octahedron. [1]

   Hint: The six points of the form

$$(\pm 1, 0, 0), \quad (0, \pm 1, 0), \quad (0, 0, \pm 1)$$

   are vertices of a regular octahedron.

[1] Two planes (or lines or points) are said to be *incident* if their intersection is nonempty. A *regular octahedron* is a solid in $\mathbb{R}^3$ having eight faces, each of which is an equilateral triangle, and six vertices, each of which is incident to exactly four faces. Reference: `https://en.wikipedia.org/wiki/Octahedron`