Math 2415
More Problems on Lines and Planes

1. Find a vector parametrization and a scalar parametrization for the line passing through the point \((3, -4, 5)\) in the direction of the vector \(\mathbf{v} = -2\mathbf{i} + 7\mathbf{j} + 3\mathbf{k}\).

2. Find a vector parametrization for the line through the point \((2, 5, 6)\) and perpendicular to the plane \(2x - 4y + 5z = 9\).

3. Find a vector parametrization for the line through the point \((2, 5, 6)\) and parallel to the line with scalar parametric equations \(x = -1 - 2t, y = 3t + 7, z = 6t - 2\).

4. In most cases, the intersection of two lines in \(\mathbb{R}^2\) is a point. In most cases, what can you say about the following situations:
   (a) The intersection of two lines in \(\mathbb{R}^3\)
   (b) The intersection of two planes in \(\mathbb{R}^3\)
   (c) The intersection of a line and a plane in \(\mathbb{R}^3\)

5. Consider the line \(\mathbf{r}(t) = (1 + 2t, -1 - t, 3t)\). Find the point of intersection of this line with the \(xz\)-plane. Does this line intersect the \(y\)-axis?

6. Find a parametrization for the line of intersection of the planes \(3x - 6y - 2z = 3\) and \(2x + y - 2z = 2\).

7. In some special cases, the intersection of two lines in \(\mathbb{R}^3\) is a point. Find the point of intersection of the lines \(x = 2t + 1, y = 3t + 2, z = 4t + 3\) and \(x = s + 2, y = 2s + 4, z = -4s - 1\). Explain why these two lines both lie in the same plane. Find the equation of this plane.

8. Do the lines \(x = 2t + 1, y = 3t + 2, z = 4t + 3\) and \(x = s + 2, y = 2s + 4, z = -4s\) intersect?