Math 2415
More Problems on Lines and Planes

1. Find the equation of the plane that contains the point \((1, 2, 3)\) and is perpendicular to the line 
   \(r(t) = (4 - t, 5 + 6t, 7 - 2t)\).

2. Find the equation of two different planes that both contain the point \(p = (1, 2, 3)\) and are 
   parallel to the line \(L\) with parametrization \(r(t) = (4 - t, 5 + 6t, 7 - 2t)\). How many planes 
   contain \(p\) and \(L\)? Why?

3. Find a parametrization of the line through the point \((1, 2, -4)\) that is perpendicular to the 
   plane \(x + 2y + 4z = 8\).

4. Is the line \(r(t) = (1 - 2t, 2 + 5t, -3t)\) parallel to the plane \(2x + y - z = 8\)?

5. 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 \(\mathbb{R}^3\)

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

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

8. In some special cases, the intersection of two lines in \(\mathbb{R}^3\) is a point. Find the point of inter-
   section 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.

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