Problem Session –February 1, 2006

1. Find the parametric equations for the plane through the point \((1,2,4)\) spanned by the vectors \(\mathbf{u} = 6\mathbf{i} - 3\mathbf{j} + 2\mathbf{k}\) and \(\mathbf{v} = -\mathbf{i} + \mathbf{j} - \mathbf{k}\). Does the point \((2,1,5)\) lie on the plane? (Hint: set the parametric equation for the first coordinate to 2, the second to 1, and the third to 5 and try to find \(s\) and \(t\) that satisfy all 3 equations).

2. Let \(\ell\) be the line \((2,1,0) + t(1,1,1)\) and \(\Pi\) be the plane \(x - 3y + 2z = 4\). Do \(\ell\) and \(\Pi\) intersect? Justify your answer.

3. Find the line of intersection of the two planes \(x + 2y + 3z = 6\) and \(x + y + z = 3\). You can either a. **Guess** values of \(x\), \(y\), and \(z\) (use 0 or 1) that will satisfy both equations. If you find 2 points that satisfy both equations, you can use them to find the equation of the line. OR b. **Solve both equations** for \(x\) and set the resulting equations equal to find a relationship between \(y\) and \(z\). Plus this relationship into the second equation to find a relationship between \(x\) and \(z\). Then you can pick a value of \(z\) and use the relationships to find \(x\) and \(y\). This will give two points on the line.

4. Write the scalar equation for the plane through \((1,2,3)\) that is perpendicular to the line through \((1,2,3)\) and \((2,3,4)\).

5. Find an equation for the line through \((1,1,3)\) that is parallel to the line \(x = 2 - t, y = -t, z = 3 + 3t\)

**For tomorrow:** Try problems #6, 16, 19 on page 697 and read Section 12.9