Due Thursday September 20.

1. A molecule of methane has a single C (Carbon) atom at its center surrounded symmetrically by four H (Hydrogen) atoms. The H atoms form the vertices of a regular tetrahedron. What is the angle H-C-H that two H atoms make at the center C. (Hint: One can form a regular tetrahedron by taking four vertices of a cube, with no two adjacent)

2. Give a “vector” proof of the fact that two lines \( y = m_1x + b_1 \) and \( y = m_2x + b_2 \) are perpendicular if and only if the slopes satisfy \( m_1m_2 = -1 \).

   (a) Show that this ISBN cannot be correct.
   (b) Assuming a single error in the 5th digit, find the correct ISBN.

4. Show that \( \mathbf{u} \times (\mathbf{v} \times \mathbf{w}) = (\mathbf{u} \cdot \mathbf{w})\mathbf{v} - (\mathbf{u} \cdot \mathbf{v})\mathbf{w} \).

5. Put the following parametric form of a plane into normal form.
   \[ \mathbf{x} = [1, 2, 1] + t[0, 2, 3] + s[-1, 0, 7] \]

6. Using vectors, show that the perpendicular bisectors of the sides of a triangle all meet at a single point. (The perpendicular bisector of \( AB \) is the line perpendicular to \( AB \) that goes through the midpoint of \( AB \).)