1. [4pts] Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for the parametric curve: $x = t + \sin t$, $y = t - \cos t$.

2. [6pts] (a) Find all points of intersection of the polar curves: $r = \sin \theta$, $r = \sin 2\theta$.
(b) Set up an integral to find the area inside the first curve and outside the second curve.
3. [4pts] Find all values (if any) of the real number $a$ such that the angle between the vectors $\vec{u} = \langle 1, a, a \rangle$ and $\vec{v} = \langle 1, 0, -1 \rangle$ is (a) $\pi/4$, (b) $\pi/2$.

4. [4pts] Find symmetric equations of the line passing through the point $(-2, 2, 4)$ and perpendicular to the plane $2x - y + 5z = 12$. 
5. [4pts] Find an equation of the plane that passes through the point (1, 2, 3) and contains the line: 
\( x = 3t, y = 1 + t, z = 2 - t. \)

6. [6pts] Let \( \overrightarrow{u} = \langle 1, -1, 2 \rangle, \overrightarrow{v} = \langle 1, 0, -1 \rangle, \overrightarrow{w} = \langle 3, 1, 0 \rangle. \) Find:
(a) \( (\overrightarrow{u} + \overrightarrow{v}) \times (\overrightarrow{u} - \overrightarrow{v}) \).
(b) \( \text{comp}_{\overrightarrow{w}}(\overrightarrow{u} + \overrightarrow{v}) \).
(c) The area of the triangle determined by \( 19\overrightarrow{u} - \overrightarrow{v} \) and \( \overrightarrow{u}. \)