1. (3 pts) Find the length of the polar curve $r = 1 - \cos \theta$, $0 \leq \theta \leq 2\pi$.

2. (3 pts) Find the equation of the sphere with center $(2, -3, 6)$ that touches the $yz$-plane.

3. (4 pts) If $\vec{v}$ lies in the first quadrant and makes an angle $\frac{\pi}{6}$ with the positive $x$-axis and $|\vec{v}| = 2$, find $\vec{v}$ in component form.
Instructions: Show Your Work!

1. (3 pts) Find the area inside the circle \( r = 6 \) and above \( r = 3 \csc \theta \).

2. (3 pts) Find an equation of a sphere if one of its diameters has \((4, -3, 6)\) as one end-point and the other end touches the \(yz\)-plane.

3. (4 pts) If \( \vec{v} \) lies in the first quadrant and makes an angle \( \frac{\pi}{3} \) with the positive \( x \)-axis and \( |\vec{v}| = 4 \), find \( \vec{v} \) in component form.