1. Let \( \vec{a} = \langle 1, -1, 4 \rangle \), \( \vec{b} = \langle 2, -1, 3 \rangle \), \( \vec{c} = \langle -4, 2, -6 \rangle \)
   a) Are \( \vec{a} \) and \( \vec{b} \) orthogonal? Explain.
   b) Find a unit vector orthogonal to both \( \vec{a} \) and \( \vec{c} \).

2. Find the area of the triangle with vertices \( P(-1,0,1) \), \( Q(1,1,2) \) and \( R(0,1,3) \).

3. Show that the line \( \frac{x-2}{3} = \frac{y-3}{2} = z-1 \) never intersects the plane \( 2x - y - 4z = 87 \).

4. Find scalar parametric equations for the line containing the point \( P(1,1,2) \) and parallel to the line \( \frac{x-2}{3} = \frac{y-3}{2} = z-1 \).

5. Find an equation for the plane containing the point \( P(1,1,1) \) and the line \( \frac{x-2}{3} = \frac{y-3}{2} = z-1 \).

6. Find the work done by the force \( \vec{F} = \langle 2, -3, 1 \rangle \) in moving an object from \( P(1,0,2) \) 4 units toward the point \( Q(2,4,0) \).

7. The vector function \( \vec{F}(t) = \langle 2\sin t, e^t, t \rangle \) represents a space curve.
   a) What value of \( t \) produces the point \( (0,1,0) \) on the curve?
   b) Find parametric equs for the line tangent to this curve at the point \( P(0,1,0) \).

8. A projectile is fired with an initial speed of 800 ft/s and angle of elevation 30° from ground level. Find the range of the projectile, the maximum height it reaches, and its speed upon impact.