1) Consider the vectors $u = (1, -2, 3)$ and $v = (1, -2, 4)$.
   a) Find $\|u + v\|$.
   b) Find the vector component of u along v **and** the vector component of u orthogonal to v.
   c) Find cosine of the angle between u and v.

2) Find the distance between the point $P(1,1,1)$ and the plane passing through the points $P_1(2,0,3), P_2(-1,1,3)$ and $P_3(0,1,2)$.

3) a) Find parametric equations for the line of intersection of the planes : $x - 2y + 3z = -2$ and $-3x + y + 2z + 5 = 0$.
b) Find an equation for the plane passing through $P(-2,1,7)$ that is perpendicular to the line $x - 4 = 2t, y + 2 = 3t, z = -5t, -\infty < t < \infty$.

4) Consider the linear operators $T: R^2 \to R^2$ and $S: R^2 \to R^2$ where T has the standard matrix representation $[T] = \begin{bmatrix} 1 & 3 \\ 3 & 0 \end{bmatrix}$ and S is the rotational operator counterclockwise by an angle $\frac{\pi}{3}$.

   a) Is the operator T one to one ? Onto? Why?

   b) Find the vector $v = (ToS)(u)$, where $u = (\frac{-1}{2}, \frac{\sqrt{3}}{2})$.

   c) Find $T(-1,2)$ and $S(1,1)$.

   d) Find $(SoT)^{-1}(w)$ if exists, where $w = (1,1)$.