1. Given the points $P(1, -1, 1), Q(1, 0, 1)$ and $R(0, 1, 2)$ in 3-space.

   a) Find the angle, in degrees, at the vertex $R$ of the triangle with vertices $P$, $Q$ and $R$.

   b) Find the area of the triangle having vertices $P$, $Q$ and $R$. 
c) Find the equation of the plane containing the points \( P, Q \) and \( R \).

d) Find the equations for the line through \( P \) which is perpendicular to the plane containing the triangle having vertices \( P, Q \) and \( R \).
2. Given vectors \( \vec{a} = 2i + j - k \), \( \vec{b} = i + j - 5k \) and \( \vec{c} = i + 2j - k \) find
   a) The area of the parallelogram determined by \( \vec{a} \) and \( \vec{b} \).
   b) The volume of the parallelepiped determined by \( \vec{a} \), \( \vec{b} \) and \( \vec{c} \).
3. Given the two planes $2x - y + 3z = 2$ and $2x + 2y + 2z = 0$
   a) Find the angle (acute) between the planes.

   b) Find the distance from the point $P(1, 0, 3)$ and the plane $2x - y + 3z = 2$. 
4. An object is moving in 3-space in such a way that it’s acceleration vector is $\vec{a} = -3j - \cos(t)k$. Suppose that at time $t = 0$ it’s velocity vector is $\vec{v}(0) = 2i$ and it’s position vector is $\vec{r}(0) = i + k$. Find the velocity vector and the position vector as functions of $t$. Then give the parametric equations of the motion.
5. Classify and sketch the following surfaces.

a) \(3x + 4z = 12\)

b) \(\frac{x^2}{4} - \frac{y^2}{9} - z^2 = 1\)

c) \(\frac{x^2}{4} - \frac{y^2}{9} - z^2 = 0\)