1. Let $\vec{a} = \langle\, 4, -3, -1\,\rangle$ and $\vec{b} = \langle\, -2, -3, 5\,\rangle$. Compute the following:
   (a) $\vec{a} + \vec{b}$ (b) $2\vec{a} - 3\vec{b}$ (c) $||\vec{a} + \vec{b}||$
   (d) $\vec{a} \cdot \vec{b}$ (e) $\vec{a} \times \vec{b}$ (f) $\text{proj}_{\vec{a}}\vec{b}$

2. Find the area of the triangle with vertices $(1, 2, 3)$, $(3, 1, 5)$ and $(4, 5, 6)$.

3. 3 points are collinear if they lie on the same line. Determine whether the points $(1, 1, 2)$, $(0, 1, 0)$ and $(1, 2, 3)$ are collinear. (Hint: cross product)

4. 4 points are coplanar if they lie of the same plane. Determine whether the points $(0, 2, 1)$, $(0, 1, 0)$, $(1, 1, 0)$ and $(1, 2, 3)$ are coplanar. (Hint: scalar triple product)

5. Find the angle between the vectors $\vec{a} = -4\vec{i} + 2\vec{j} + 3\vec{k}$ and $\vec{b} = 2\vec{i} + \vec{j} + 5\vec{k}$.

6. Find the angle that $\vec{a}$ makes with the z–axis.

7. Find the angle between the planes $y - z = 5$ and $x - z = 7$.

8. Find the equation of the plane passing through the points $(1, 3, 2)$, $(0, 3, 0)$ and $(2, 4, 3)$.

9. Find the equation of a plane passing through point $(2, 1, 0)$ and parallel to the plane $x - 2y + 5z = 3$. Does this plane pass through the origin ?

10. Find the equation of a plane perpendicular to the line $x = 2 + 3t$, $y = -t$, $z = -1 + t$ and passing through point $(0, 1, -1)$.

11. Identify the following surfaces using their traces in planes parallel to the co-ordinate planes.
    (a) $9x^2 + 4y^2 = 2z^2$ (b) $4x^2 + 4y^2 + z^2 = 16$ (c) $4x^2 + 4y^2 - z^2 = 16$
    (d) $9x^2 - 4y^2 = 72$ (e) $z = 9x^2 - 4y^2$ (f) $z = 9x^2 + 4y^2$