MATH 2210 - EXAM I PROBLEMS

1) Using the dot product, determine the angles of the triangle given by the vertices $(0,1)$, $(2,3)$ and $(4,1)$.

2) Given two vectors $v = (-4,3)$ and $u = (2,-1)$, and another vector $w = (-2,3)$, find numbers x and y such that

$$w = xv + yu.$$

3) Let π be the plane given by the equation $x - y - z + 10 = 0$ and $P = (1,1,1)$ a point.
a) Find the parametric equations of the line ℓ through P and perpendicular to π.
b) Find the point Q of intersection of the line ℓ and the plane π.
c) Find the equation of the plane passing through P and parallel to π.

4) Find the equation of the plane passing through $(0,1,1)$, $(2,0,0)$ and $(3,-1,0)$ (use cross product).

5) The planes $x + y + z = 3$ and $x + 2y + 3z = 6$ intersect in a line. Find at least two points on that line.

6) The position of a particle at a time t is given by $(\sin 3t, \sqrt{t}, \cos 3t)$.
a) Find the velocity vector at time t.
b) At what time t does the particle reach the plane $y = \sqrt{\frac{\pi}{2}}$? Find the tangent line to the path of the particle at this position.

7) Let S be the square with vertices at $(0,0), (1,0), (1,1)$ and $(0,1)$. Find the image of the square S under the linear transformation given by the 2×2 matrix

$$\begin{pmatrix} 1 & 2 \\ 2 & 4 \end{pmatrix}.$$