(1) (M&T, §1.3: #2(a)) Find the determinant $\begin{vmatrix} 2 & -1 & 0 \\ 4 & 3 & 2 \\ 3 & 0 & 1 \end{vmatrix}$.

(2) (M&T, §1.3: #14) Compute $\vec{u}+\vec{v}$, $\vec{u}\cdot\vec{v}$, $\|\vec{u}\|$, $\|\vec{v}\|$ and $\vec{u}\times\vec{v}$ where $\vec{u} = 3\vec{i}+\vec{j}-\vec{k}$ and $\vec{v} = -6\vec{i}-2\vec{j}-2\vec{k}$.

(3) (M&T, §1.3: #15(c)) Find an equation for the plane that is perpendicular to the line $\ell(t) = (5,0,2)t + (3,-1,1)$ and passes through the point $(5,-1,0)$.

(4) (M&T, §1.3: # 38) Give vectors $\vec{a},\vec{b} \in \mathbb{R}^3$, do the equations $\vec{u}\times\vec{a} = \vec{b}$ and $\vec{u}\cdot\vec{a} = \|\vec{a}\|$ determine a unique vector $\vec{u}$? Argue *both* geometrically and analytically.

(5) Let $\vec{u},\vec{v},\vec{w}$ be three vectors that are not co-planar, namely

$$\alpha\vec{u}+\beta\vec{v}+\gamma\vec{w} = \vec{0} \qquad \text{if and only if} \qquad \alpha=\beta=\gamma=0.$$

(a) Show that $\vec{u}\times\vec{v}, \vec{v}\times\vec{w}, \vec{w}\times\vec{u}$ are not co-planar.

(b) Suppose $a,b,c\in\mathbb{R}$, find the point of intersections of the three planes

$$\vec{u}\cdot(x,y,z) = a, \qquad \vec{v}\cdot(x,y,z) = b, \qquad \vec{w}\cdot(x,y,z) = c$$

Express the solution (x,y,z) as

$$(x,y,z) = \alpha\vec{v}\times\vec{w} + \beta\vec{w}\times\vec{u} + \gamma\vec{u}\times\vec{v}$$