Math 2211: Recitation 3 (T)

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(1) Solve any **two** the following problems:

   (a) Find the cross product of $\vec{a} = 2\vec{i} - 3\vec{j} + 4\vec{k}$ and $\vec{b} = \vec{i} + 2\vec{j} - 3\vec{k}$. Show that the vector $\vec{a} \times \vec{b}$ is orthogonal to both $\vec{a}$ and $\vec{b}$. Finally, find the angle between the vector $\vec{a}$ and $\vec{b}$.

   (b) Consider the points $P(1, 2, 1)$, $Q(-1, -1, 3)$ and $R(0, 3, 2)$. Find a nonzero vector orthogonal to the plane through the points P, Q and R. Find the area of the triangle PQR.

   (c) Find the volume of the parallelepiped determined by the following vectors
$$\vec{a} = \langle 1, 2, 1 \rangle, \quad \vec{b} = \langle -1, -1, 3 \rangle, \quad \vec{c} = \langle 0, 2, 2 \rangle$$

(2) Solve the following problems. **(Do any two of them)**.

   (a) Find the scalar projection and vector projection of $\vec{b}$ onto $\vec{a}$ where
$$\vec{a} = \langle 2, 2, 1 \rangle, \quad \vec{b} = \langle 3, -1, 3 \rangle$$

(b) Consider the triangle determined by the points $P(-1, -2, -4)$, $Q(0, 1, -6)$ and $R(4, -1, -7)$. Determine whether it is a right-angle triangle or not.

(c) Find a parametric equation for the line passing through the point $(4, -9, 2)$ and parallel to the vector $\langle 1, 5, -2 \rangle$.

(Bonus) Solve the following integrals. (Do any two of them).

(a) Find an equation of the plane passing through the points $(4, -5, 2)$, $(2, 3, -1)$ and $(1, 1, 1)$.

(b) Find the parametric equation for the line of intersection of the planes $x + 2y + 3z = 3$ and $x - y + z = 3$.

(c) Find a parametric equation for the line passing through the point $(4, -9, 2)$ and parallel to the vector $\langle 1, 5, -2 \rangle$.