MATH 104: WORKSHEET 2

1. Concepts

(1) Dot products; cross products; scalar triple products
(2) Geometry of vectors

2. Discussions

Question 1. What is the value of c so that the planes $2cx - y + c^2 = 15$ and $x + 5cy - 3z = 4$ are orthogonal?

Question 2. What is the angle between the planes $x - 2y + 3z = 6$ and $2x + 3y - z = 11$?

Question 3. What is the angle between the grand diagonal of a cube in $\mathbb{R}^n$ and an incident edge?
(Hint: try $\mathbb{R}^2$ and $\mathbb{R}^3$ to have intuition first.)

Question 4. What is the area of the triangle in the plane with vertices at $(1, 3), (-2, 0), (5, 2)$?

Question 5. What is the volume of the parallelopiped spanned by the vectors $\hat{i}, \hat{j}$ and $\vec{v}$.

Question 6. What is the projected length (component) of vector $\vec{w}$ onto the vector $\vec{v}$:

$$\vec{w} = \begin{pmatrix} 5 \\ -6 \\ 2 \\ -7 \end{pmatrix}, \quad \vec{v} = \begin{pmatrix} 0 \\ 3 \\ 4 \\ 0 \end{pmatrix}.$$

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