MA261 Quiz 1

June 17, 2016

Problem 1.

Given $\mathbf{a} = (3, 0, 2)$ and $\mathbf{b} = (1, 2, 0)$, find t such that the vector $\mathbf{c} = (4, t+1, 2)$ is perpendicular to $\mathbf{a} \times \mathbf{b}$.

Solution.

By direct computation,

$$\mathbf{a} \times \mathbf{b} = (-4, 2, 6)$$

 $\mathbf{c} \cdot (\mathbf{a} \times \mathbf{b}) = 2t - 2 = 0$

So t = 1. (In fact, $\mathbf{c} = \mathbf{a} + \mathbf{b}$.)

Problem 2.

Find s so that a triangle with vertices at $(0,0,0),\,(0,s,-3)$ and (0,1,s+2) has area 1.

Solution.

 Set

$$\mathbf{u} = (0, s, -3)$$

 $\mathbf{v} = (0, 1, s + 2)$

The area of the triangle is half of the magnitude of $\mathbf{u} \times \mathbf{v}$.

$$|\mathbf{u} \times \mathbf{v}| = |(s^2 + 2s + 3)\hat{i}| = s^2 + 2s + 3$$
$$s^2 + 2s + 3 = 2$$
$$s^2 + 2s + 1 = 0$$
$$s = -1$$