

## Homework 2

**Problem 1.** Let  $\mathbf{v} = \langle 0, 7, 0 \rangle$  and let  $\mathbf{u}$  be a vector of length 5 which starts at the origin and lies in the  $x - y$  plane. Find the maximum value of the length of the vector  $\mathbf{u} \times \mathbf{v}$ .

**Problem 2.** Find the components of the vector from the point  $A$  to the midpoint of  $\overline{BC}$ , where

$$A = (1, 0, 1) \quad B = (1, 1, 0) \quad \text{and} \quad C = (0, 1, 1)$$

**Problem 3.** The set of points equidistant from the points  $(2, -1, 1)$  and  $(4, 3, -5)$  is a plane. What is the equation of the plane?

**Problem 4.** Find the area of the parallelogram three of whose vertices are  $(0, 0, 0)$ ,  $(1, 2, 3)$  and  $(-1, 1, -1)$ .

**Problem 5.** True or false. Given a reason or a counterexample.

(A) If  $\vec{a}$  is a non-zero vector in three space, then  $\text{proj}_{\vec{a} \times \vec{k}}(\vec{a}) = \vec{0}$ .

(B) The vector  $(\vec{j} \times (\vec{k} \times \vec{j})) \times \vec{i}$  is a unit vector.

(C) If  $\vec{a}$  and  $\vec{b}$  are perpendicular and non-zero, then  $3\vec{a} + 2\vec{b}$  and  $-3\vec{a} + 2\vec{b}$  have the same length.