Math 114. Fall 2014. HW 1.

Name _____ **TA Session** _____

Instructions for written homework.

- You are encouraged to work with others on these problems. You are expected to write the solutions yourself.
- Your solutions should be legible and well organized. **Graders will deduct points for solutions that are difficult to read, or are disorganized.** For the benefit of the grader, please turn in solutions to problems in the assigned order, i.e. #1, then #2, then #3, etc.
- Staple your pages together. Do not turn in notebook paper with tattered edges. **Homework that is unstapled or is lacking a name will not be graded.**

Problem 1 (Fall 2008)**.** Which of the following equations in x and y is equivalent to the statement that the vectors

$$A = \langle x + y, 1, y \rangle \quad \text{and} \quad B = \langle 1, x - y, -1 \rangle$$

are perpendicular to each other ?

(A) $x - 2y = 0$

(B) $2x - y = 0$

(C) $2x + y = 0$

(D) $x - y = 0$

(E) $x + 2y = 0$

(F) none of the above

Problem 2 (Fall 2008)**.** 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 $\mathbf{u} \times \mathbf{v}$.

(A) $|\mathbf{u} \times \mathbf{v}| = 12$

(B) $|\mathbf{u} \times \mathbf{v}| = 30$

(C) $|\mathbf{u} \times \mathbf{v}| = 35$

(D) $|\mathbf{u} \times \mathbf{v}| = 1$

(E) $|\mathbf{u} \times \mathbf{v}| = 140$

(F) none of the above

Problem 3 (Fall 2010)**.** Find the components of the vector from the point A to the midpoint of $\overline{BC}$, where

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

(A) $\langle 1, 1/2, 1/2 \rangle$

(B) $\langle 1, -1/2, -1/2 \rangle$

(C) $\langle 1/2, 1, 1/2 \rangle$

(D) $\langle 1, 0, 1 \rangle$

(E) $\langle 1, 1/2, 1 \rangle$

(F) $\langle 0, 1/2, -1/2 \rangle$

(G) $\langle -1/2, 1, -1/2 \rangle$

(H) $\langle 1, -1/2, -1 \rangle$

Problem 4 (Spring 2011)**.** 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?

(A) $3x + y - 2z = 0$

(B) $2x + 4y - 6z = -6$

(C) $x + 2y - 3z = 11$

(D) $2x + 14y + 10z = 15$

(E) $6x + 2y - 4z = 5$

(F) $x + y + z = 2$

(G) $2x + 2y + 2z = 7$

(H) $x + 7y + 5z = 0$

Problem 5 (Fall 2011)**.** Find the area of the parallelogram three of whose vertices are $(0, 0, 0)$, $(1, 2, 3)$ and $(-1, 1, -1)$.

(A) $\sqrt{29}$

(B) $\sqrt{38}$

(C) $\sqrt{30}$

(D) 8

(E) $\sqrt{5}$

(F) $2\sqrt{5}$

(G) 6

Problem 6 (Fall 2009)**.** True or false. Given a reason or a counterexample.

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

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

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