Math 32A Worksheet 1

Sections 13.1, 13.2, 13.3

October 9, 2018

Problem 1. Given $\vec{v} = (2, 3)$ and $\vec{w} = (-1, 0)$.

(a) Express $\vec{u} = (4, 3)$ as a linear combination of $\vec{v}$ and $\vec{w}$.
(b) Can any vector $\vec{u}$ be written as a linear combination of $\vec{v}$ and $\vec{w}$?

Problem 2. Let $\vec{v} = (-1, 2)$ and $\vec{w} = (2, 1)$. Draw the vectors $\vec{v}, \vec{w}, \vec{v} + 2\vec{w}$, and $\vec{v} - 2\vec{w}$ on the coordinate system.

Problem 3. Given a vector $\vec{v} = (2, 3\lambda, 1)$ and $\vec{w} = (-1, 0, \lambda)$.

(a) Find $\lambda$ so that $\vec{v} \perp \vec{w}$.
(b) Is there any $\lambda$ so that $\vec{v} \parallel \vec{w}$?

Problem 4. Let $(C)$ be a sphere centered at $C = (-1, 0, 1)$. Suppose $A = (2, 1, 0)$ is a point on the sphere. The line goes through $C$ and $A$ cuts the sphere at a point $B$ other than $A$. Find the coordinates of $B$.

Problem 5. Given three points in $\mathbb{R}^3$: $A = (-1, 0, 2)$, $B = (2, -1, 0)$ and $C = (0, 1, 2)$.

(a) Compute the three angles of triangle $ABC$.
(b) Let $M$ be the midpoint of the segment $BC$. What is the coordinates of $M$?
(c) Check that $2\overrightarrow{AM} = \overrightarrow{AB} + \overrightarrow{AC}$. Indeed, this formula is true in general.
(d) Conclude from (c) that $4AM^2 = AB^2 + AC^2 + 2AB \cdot AC \cdot \cos \angle A$.

Problem 6. Describe (draw) the sets of points such that

(a) $(x - 1)^2 + y^2 + (z + 1)^2 = 2$  \quad (b) $x^2 + (y - 1)^2 = 4$ and $z \leq -2$. 

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