MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

Assignment 1 **Mathematics 2050** **Fall 2018**

Due: Sept 21, 2018 SHOW ALL WORK

[6] 1. Vector $\vec{w}$ has the starting point $(1, 2, 3)$ and the ending point $(-4, 7, 5)$. which of the following vectors is parallel to $\vec{w}$?

(a) $\vec{u} = \begin{bmatrix} 3 \\ 4 \\ -1 \end{bmatrix}$, (b) $\vec{v} = \begin{bmatrix} 10 \\ -10 \\ -4 \end{bmatrix}$ (c) $\vec{x} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$

[4] 2. The shape $ABCD$ is a parallelogram where $A(1, 0, 0), B(2, 1, 1),\ C(3, 4, 5)$. Find the coordinate of the point D. What is the coordinate of the intersection point of AC and BD?

[4] 3. Let $P_1(1, 2, -1)$ and $P_2(3, 4, 5)$. Find the point of P on the line segment of P_1 and P_2, so that P_2P is $\frac{1}{4}$ of P_2P_1.

[6] 4. (a) Is $\vec{w} = \begin{bmatrix} 1 \\ 10 \end{bmatrix}$ a linear combination of $\vec{u} = \begin{bmatrix} 1 \\ 4 \end{bmatrix}$ and $\vec{v} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$?

(b) Can every vector $\vec{w} = \begin{bmatrix} a \\ b \end{bmatrix}$ be written as a linear combination of $\vec{u}$ and $\vec{v}$?

[6] 5. In each of the following case, either express p as a linear combination of u, v, w, or explain why there is no such linear combination.

(a) $p = \begin{bmatrix} 4 \\ 5 \\ 3 \end{bmatrix}$, $u = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$, $v = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$, $w = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$

(b) $p = \begin{bmatrix} -1 \\ 2 \\ 4 \\ 0 \end{bmatrix}$, $u = \begin{bmatrix} 3 \\ 7 \\ 0 \\ -4 \end{bmatrix}$, $v = \begin{bmatrix} 0 \\ 2 \\ 0 \\ 9 \end{bmatrix}$, $w = \begin{bmatrix} 3 \\ 1 \\ 4 \\ 5 \end{bmatrix}$

[3] 6. Let $\vec{u}, \vec{v}$ and $\vec{w}$ be vectors. Show that any linear combination of $\vec{u}, \vec{v}$ is also a linear combination of $-2\vec{u},\ 3\vec{v}$ and $\vec{w}$.

[6] 7. In each case, determine whether $\vec{u}$ is in the plane spanned by $\vec{v}$ and $\vec{w}$.

(a) $\vec{u} = \begin{bmatrix} -5 \\ 0 \\ 6 \end{bmatrix}$ $\vec{v} = \begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}$ $\vec{w} = \begin{bmatrix} 3 \\ 4 \\ 0 \end{bmatrix}$

(b) $\vec{u} = \begin{bmatrix} 6 \\ 7 \end{bmatrix}$ $\vec{v} = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$ $\vec{w} = \begin{bmatrix} 4 \\ 7 \end{bmatrix}$

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[35]