MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECTION 1.3 **Math 2050 Worksheet** WINTER 2018

For practice only. Not to be submitted.

1. Given $\mathbf{u} = \begin{bmatrix} 4 \\ -1 \\ 1 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 1 \\ 0 \\ -3 \end{bmatrix}$, find all values of the scalar k such that $2\mathbf{u} - k\mathbf{v}$ is orthogonal to

   (a) $\mathbf{u}$ (b) $\mathbf{v}$ (c) $\mathbf{u} \times \mathbf{v}$

2. Let $\mathbf{u}$ and $\mathbf{v}$ be non-orthogonal vectors. Find an expression for the scalar k such that $k\mathbf{u} + \mathbf{v}$ is orthogonal to $\mathbf{v}$.

3. Find an equation of the plane spanned by the vectors $\mathbf{u} = \begin{bmatrix} 2 \\ 4 \\ 5 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} -1 \\ 3 \\ 0 \end{bmatrix}$.

4. Find an equation of the plane containing the points $A(0, 4, -1)$, $B(6, 2, 2)$ and $C(1, -1, -3)$.

5. Find vector and parametric equations of the line through the points $P(1, 6, 0)$ and $Q(5, -3, 0)$.

6. Show that the lines with vector equations

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \\ 9 \end{bmatrix} + t \begin{bmatrix} -3 \\ 3 \\ 2 \end{bmatrix} \quad \text{and} \quad \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 16 \\ -11 \\ -1 \end{bmatrix} + t \begin{bmatrix} 6 \\ -6 \\ -4 \end{bmatrix}$$

   are the same.

7. Determine whether the lines with vector equations

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ 0 \\ 0 \end{bmatrix} + t \begin{bmatrix} 2 \\ 1 \\ -4 \end{bmatrix} \quad \text{and} \quad \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ -3 \\ 4 \end{bmatrix} + t \begin{bmatrix} 6 \\ 3 \\ -12 \end{bmatrix}$$

   intersect. If so, find their point of intersection.

8. Determine whether the plane with equation $x - 6y + 5z = 10$ and the line with vector equation

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 3 \\ -1 \end{bmatrix} + t \begin{bmatrix} -8 \\ 3 \\ 3 \end{bmatrix}$$

   intersect. If so, find their point of intersection.