

MEMORIAL UNIVERSITY OF NEWFOUNDLAND  
DEPARTMENT OF MATHEMATICS AND STATISTICS

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Assignment 3

Mathematics 2050

fall 2017

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**Due: October 4, 2017 . SHOW ALL WORK**

- [3] 1. Find the equation of a plane with x-intercept = 1, y-intercept = 2 and z-intercept = -3.
- [3] 2. Find two vectors of length 3 which are perpendicular to both  $\vec{u} = \begin{bmatrix} 2 \\ -1 \\ 3 \end{bmatrix}$  and  $\vec{v} = \begin{bmatrix} 1 \\ -2 \\ 1 \end{bmatrix}$
- [4] 3. Given  $\|\vec{u}\| = 10$ ,  $\|\vec{v}\| = 14$  and  $\|\vec{u} \times \vec{v}\| = 70$ , find all possible values of  $\vec{u} \cdot \vec{v}$ .
4. Find the equation of the following planes.
- [3] (a) the plane passing through the point (0, 1, 2) and containing the line  $x = y = z$ .
- [3] (b) Find an equation describing the plane which goes through the point (1, 3, 5) and is perpendicular to the vector  $\vec{u} = \begin{bmatrix} 2 \\ -1 \\ 3 \end{bmatrix}$
5. Consider the points  $A(1, -2, 1)$ ,  $B(2, -2, -1)$  and  $C(4, 1, 1)$ .
- [4] (a) Find the equation of the plane passing through  $A$ ,  $B$ , and  $C$ .
- [4] (b) Find the area of the triangle ABC.
- [4] 6. Find the intersection of the line  $x = t, y = 2t, z = 3t$ , and the plane  $x + y + z = 1$ .
- [4] 7. Let  $\ell_1$  be the line with parametric equation  $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix} + t \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$  and  $\ell_2$  be the line described parametrically by  $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ 0 \end{bmatrix} + s \begin{bmatrix} 0 \\ 3 \\ 1 \end{bmatrix}$ . How many planes are there which contain  $\ell_2$  and are parallel to  $\ell_1$ ? Find an equation describing one such plane.
- [4] 8. Find the foot of the perpendicular from the point  $P(1, -2, 3)$  to the plane  $\pi : 3x + 2y - z = 10$
- [4] 9. The line lying on the planes  $x + y + z = 2$  and  $3x - 4y + 5z = 6$