DEPARTMENT OF MATHEMATICS & STATISTICS

MT251P

Homework 3

Due by 4 p.m. on November 25, 2022

1. Suppose $\underline{u} = 3i + j - 3k$ and $\underline{w} = 6j + 2k$. Find $2\underline{w} - 4\underline{u}$, $||\underline{u} - \underline{w}||$, $\underline{u}.\underline{w}$ and the angle between $\underline{u}$ and $\underline{w}$.

2. Prove that $|\underline{u} - \underline{w}|| \geq ||\underline{u}|| - ||\underline{w}||$, for all $\underline{u}, \underline{w} \in \mathbb{R}^n$, for $n \geq 1$.

3. In each case below, state whether the statement is true or false. Justify your answer in each case.

(i) $(\underline{a} \times \underline{b}) + (\underline{b} \times \underline{a}) = \underline{a} \times 2\underline{a}$, for all $\underline{a}, \underline{b} \in \mathbb{R}^3$.

(ii) There are vectors $\underline{a}, \underline{b} \in \mathbb{R}^3$ such that $(\underline{a} \times \underline{b}).(\underline{a} \times \underline{b}) < 0$.

4. Find the equation of the plane containing the points $(2, 1, -1), (0, -2, 0), (1, -1, 2)$.

5. Find the parametric equation of the line that is the intersection of the planes $2x + 4y - 4z + 16 = 0$ and $5z - 2y + 2x = -4$.