

INFOLINK UNIVERSITY COLLEGE

Course Title: Linear Algebra

Assignment 1

1. Find: a) the components of $\vec{a}$ with the initial point P and terminal point Q
i.) $P=(1,3,-3)$, $Q=(4,-1,0)$ ii) $P=(4,6,-6)$, $Q=(7,5,0)$ iii) $P=(2,-1,0)$, $Q=(-4,3,5)$
2. Let i) $\vec{a} = [2, -1, 0]$, $\vec{b} = [-4, 2, 5]$, $\vec{c} = [0, 0, 3]$.
ii) $\vec{a} = [1, 2, 0]$, $\vec{b} = [3, -4, 0]$, $\vec{c} = 3i + 5j + 2k$
iii) $\vec{a} = 5i + j + 4k$, $\vec{b} = -4i + 3k$, $\vec{c} = -3i - 2j + k$. Then find the following
 - a. $\|2\vec{a} + 3\vec{b}\|$, $\|4\vec{a} - 3\vec{b}\|$ and $\|\vec{a} + \vec{b} + \vec{c}\|$
 - b. $\vec{a} \cdot \vec{b}$, $\vec{b} \cdot \vec{a}$, $\vec{a} \cdot \vec{c}$, $\vec{b} \cdot \vec{c}$, $\vec{a} \cdot \vec{c} + \vec{b} \cdot \vec{c}$, $(\vec{a} + \vec{b}) \cdot \vec{c}$ and $\vec{c} \cdot \vec{b}$
 - c. $\vec{a} \times \vec{b}$, $\vec{a} \times \vec{c}$, $\vec{a} \cdot (\vec{b} \times \vec{c})$, $\vec{b} \times \vec{a}$, $\vec{c} \times \vec{a}$, $\vec{a} \times (\vec{b} + \vec{c})$ and $\vec{a} \times \vec{b}$, $\vec{b} \cdot (\vec{a} \times \vec{c})$
3. Determine whether the given vectors are parallel, orthogonal or neither.
 - i) $\vec{a} = [4, 6]$, $\vec{b} = [-3, 2]$ ii) $\vec{a} = i - 2j + 3k$, $\vec{b} = 5i + 9k$
 - ii) $\vec{a} = [5, 0, -2]$, $\vec{b} = [4, -1, 10]$, iv) $\vec{a} = -3i + 9j + 6k$, $\vec{b} = 4i - 12j - 8k$
4. Find the vector projection of B along A . and Show that $B - Proj_A B$ is Orthogonal to A
 - i) $A = 2i - 3j + k$, $B = i + 6j - 2k$ ii) $A = -5i + 4k$, $B = i - j$
 - iii) $A = i + 2j - 3k$, $B = 3i + 5j + 7k$ iv) $A = -i + 2i - k$, $B = i + j + 2k$
5. Find the vector equation and the parametric equation for the line
 - i) Through the point $(3, 2, -3)$ parallel to the vector $2i + 7j - 7k$.
 - ii) Through the point $P_1(2, 4, -1)$ and $P_2(5, 0, 7)$
 - iii) Through the origin parallel to the vector $4j + 7k$
6. Find the equation for the plane
 - i) Through the point $(2, 5, 3)$ with normal $3i + 2j - 7k$
 - ii) Through the point $P_1(1, 2, -1)$, $P_2(2, 3, 1)$ and $P_3(3, -1, 2)$
7. Let $r_1(t) = (t + 3, 1 - t, 3t + 3)$ and $r_2(t) = \langle t + 5, -t, 3t \rangle$ be two parallel lines (that do not intersect). Find the equation of the plane containing both lines.