

Problem Set #1

Due: 17 September 2010

1. (a) Parametrize the line in \mathbb{R}^3 that passes through the points $(2, 1, 2)$ and $(3, -1, 5)$.

(b) Find a unit vector that is perpendicular to both $2\vec{i} + \vec{j} - 3\vec{k}$ and $\vec{i} + \vec{k}$.

2. (a) For all vectors $\vec{u}, \vec{v}, \vec{w} \in \mathbb{R}^n$, show that $\|\vec{u} - \vec{v}\| \leq \|\vec{u} - \vec{w}\| + \|\vec{w} - \vec{v}\|$.

(b) Suppose that \vec{x} and \vec{y} are vectors in \mathbb{R}^n . If $\|\vec{x} + \vec{y}\| = \|\vec{x} - \vec{y}\|$ then prove that \vec{x} and \vec{y} are orthogonal.

3. (a) Find a linear function whose graph in \mathbb{R}^3 is the plane that intersects the xy -plane along the line $y = 2x + 2$ and contains the point $(1, 2, 2)$.

(b) Find the equation of the plane that passes through the points $A = (2, 1, 0)$, $B = (0, 1, 3)$ and $C = (1, 0, 1)$.