CAAM 336 · DIFFERENTIAL EQUATIONS

Homework 13

Posted Monday 16 September 2013. Due 5pm Wednesday 25 September 2013.

13. [25 points]

(a) Are there any vectors $\mathbf{u}, \mathbf{v} \in \mathbb{R}^2$ which are such that $\{\mathbf{u}, \mathbf{v}\}$ is linearly independent and the set

$$\mathcal{P}_{\mathbf{u},\mathbf{v}} = \left\{\mathbf{w} \in \mathbb{R}^2 : \ \mathbf{w} = a\mathbf{u} + b\mathbf{v} \text{ where } a, b \in \mathbb{R} \text{ are such that } a \geq 0 \text{ and } b \geq 0\right\}$$

is a subspace of $\mathbb{R}^2$?

(b) Are there any vectors $\mathbf{u}, \mathbf{v} \in \mathbb{R}^2$ which are such that $\{\mathbf{u}, \mathbf{v}\}$ is linearly independent and the set

$$\mathcal{Q}_{\mathbf{u},\mathbf{v}} = \left\{\mathbf{w} \in \mathbb{R}^2 : \ \mathbf{w} = a\mathbf{u} + b\mathbf{v} \text{ where } a, b \in \mathbb{R} \text{ are such that } ab \geq 0\right\}$$

is a subspace of $\mathbb{R}^2$?