

CAAM 336 · DIFFERENTIAL EQUATIONS

Homework 45

Posted Wednesday 2 April 2014. Due 1pm Friday 25 April 2014.

45. [25 points]

Let the norm $\|\cdot\| : \mathbb{R}^2 \rightarrow \mathbb{R}$ be defined by

$$\|\mathbf{y}\| = \sqrt{\mathbf{y} \cdot \mathbf{y}}.$$

Let

$$\mathbf{A} = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$$

and consider the problem of finding $\mathbf{x}(t)$ such that

$$\mathbf{x}'(t) = \mathbf{A}\mathbf{x}(t), \quad t > 0$$

and

$$\mathbf{x}(0) = \begin{bmatrix} 2 \\ 0 \end{bmatrix}.$$

(a) Compute $\mathbf{x}(t)$.

(b) How does $\|\mathbf{x}(t)\|$ behave as $t \rightarrow \infty$?