Math 309 Quiz 2

April 15, 2016

Problem 1. Consider the system of differential equations

$$\frac{d}{dx}y = A\vec{y}, \quad A = \begin{pmatrix} a & a \\ 1 & 1-a \end{pmatrix}.$$

Here a is a real number.

(a) For which values of a is the origin a source (unstable node)?

(b) For which values of a is the origin a sink (asymptotically stable node)?

(c) For which values of a is the origin a saddle point?

Problem 2. Find the (real) general solution of the differential equation

$$\frac{d}{dx}\vec{y} = A\vec{y}, \quad A = \begin{bmatrix} -1 & 1 \\ -1 & -1 \end{bmatrix}.$$