Institute of Scientific Computing
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Winter Term 2018/19
Assignment 8
Due date: 14.12.2018

Introduction to Scientific Computing

Exercise 1: *Lyapunov direct method* **14 points**

(a) Compute the derivative of the function $V(x,y) = x^2 + y^2$ with respect to the following system of differential equations (4 points)

$$\dot{x} = y + x(1 - x^2 - y^2),$$
$$\dot{y} = -x + y(1 - x^2 - y^2).$$

(b) Using Lyapunov direct method investigate for stability the zero solution of the nonlinear system (10 points)

$$\dot{x} = -xy^2, \qquad \dot{y} = 3yx^2$$

compare the result with the eigenvalue method.