

Linearization of Nonlinear Systems

Math 230

1. Consider the nonlinear system:

$$\begin{aligned}\frac{dx}{dt} &= x(-x - 3y + 15) \\ \frac{dy}{dt} &= y(-2x - y + 10)\end{aligned}$$

(a) Find all equilibrium points of the system.

(b) Write the Jacobian matrix of the system.

(c) Use the Jacobian matrix to classify each equilibrium point, or indicate if this is not possible.

2. Classify the equilibrium points of the following nonlinear system:

$$\begin{aligned}\frac{dx}{dt} &= \sin x \\ \frac{dy}{dt} &= \cos y\end{aligned}$$