DYNAMICAL SYSTEMS, MATH 117, HW#2

Exercises 5.2, 5.3, 5.4, 5.5, and the following problems:

Problem 1.

Check that the point $(0, 0)$ is a fixed point of the map

$$f : \mathbb{R}^2 \to \mathbb{R}^2, \ f(x, y) = (-2 \sin x + 3 \cos y - 3, \sin 3x - 2y).$$

Is $(0, 0)$ an attracting fixed point of f?

Problem 2.

Determine whether the origin (i.e. the point $(0, 0)$) is an asymptotically stable singular point of the following system of differential equations:

$$\begin{cases} \dot{x} = 2xy - x + y \\ \dot{y} = 5x^4 + y^3 + 2x - 3y \end{cases}$$

Problem 3.

Determine whether the origin is an asymptotically stable singular point of the following system of differential equations:

$$\begin{cases} \dot{x} = e^{x+2y} - \cos 3x \\ \dot{y} = \sqrt{4 + 8x} - 2e^y \end{cases}$$