Assignment #12

Due on Wednesday, April 4, 2018

Read Section 5.3 on *Analysis of General Systems* in the class lecture notes at `http://pages.pomona.edu/~ajr04747/`.

Read Section 5.1 on *Equilibrium Point Analysis* in Blanchard, Devaney and Hall.

Read Section 5.2 on *Qualitative Analysis* in Blanchard, Devaney and Hall.

Do the following problems

In problems (1)–(5), for the given the two–dimensional system, (a) sketch the null-clines; (b) determine the equilibrium points; (c) find the derivative of the vector field associated with the system; (d) determine the stability of the origin for each linearized system; (e) use the principle of linearized stability (when applicable) to determine the stability type of each equilibrium point of the non–linear system; and (f) sketch the phase portrait.

1. $\begin{cases} \dot{x} &= -3x + 2xy; \\ \dot{y} &= -4y + 3xy. \end{cases}$

2. $\begin{cases} \dot{x} &= x(1 - 2y); \\ \dot{y} &= y(x - 1). \end{cases}$

3. $\begin{cases} \dot{x} &= y; \\ \dot{y} &= x - y - x^3. \end{cases}$

4. $\begin{cases} \dot{x} &= y - x^3; \\ \dot{y} &= y - 4x. \end{cases}$

5. $\begin{cases} \dot{x} &= x(1 - 2x) - 3y; \\ \dot{y} &= y(x - 1). \end{cases}$