Linearization around Equilibrium Points

Partners: 1.

2.

Use the program HPGLinearizer to study the non-linear system:

\[
\begin{align*}
\frac{dx}{dt} &= (x - y)(1 - x - y) \\
\frac{dy}{dt} &= x(2 + y)
\end{align*}
\]

First generate the phase picture for the non-linear system. From the picture, estimate where there are equilibrium points:

Equilibrium points at:

Click on the 'Equilibria' button. Then draw a little rectangle around an equilibrium point. The program will find the equilibrium point and calculate the linear approximation based at that point (i.e. it will find the linear system that best approximates the non-linear system near the equilibrium point).

For each equilibrium point, write down the linear approximation matrix and the eigenvalues. What type of equilibrium point do we get for these types of eigenvalues? Make a hand sketch of the linear approximation phase space.

Equilibrium point 1 =
Equilibrium point 2 =

Equilibrium point 3 =

Equilibrium point 4 =