Lab Assignment 3

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Problem 1

The solution starts from the initial condition $(x, y) = (3, 1)$ and increases vertically $(\frac{dy}{dt})$ while horizontally $(\frac{dx}{dt})$ it increases at first, but roughly at $x = 4$ it decreases.

Increasing the time range changed the range of the axes dramatically. The long-term behaviour of the solution seems to be that it is unstable, with $(x, y) = (3, 1)$ as its source, and it will expand indefinitely.

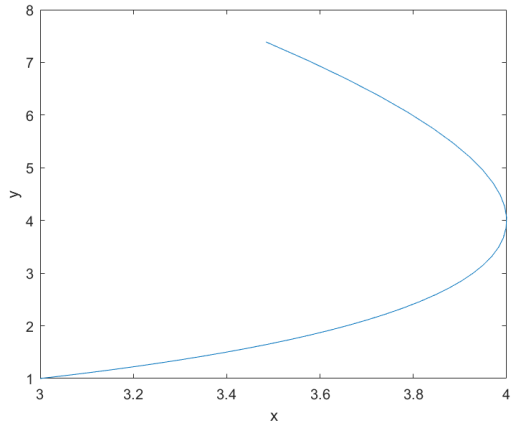

Figure 1: Time range of $0 - 1$

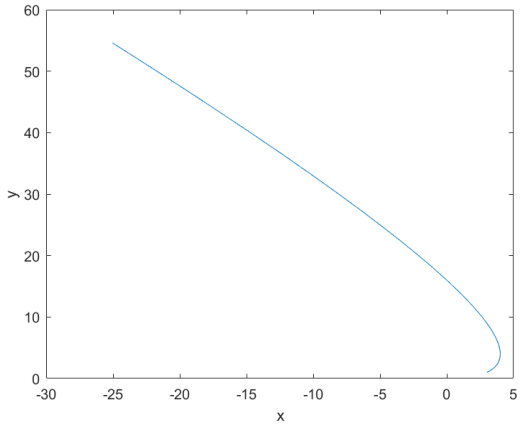

Figure 2: Time range of $0 - 2$

Problem 2

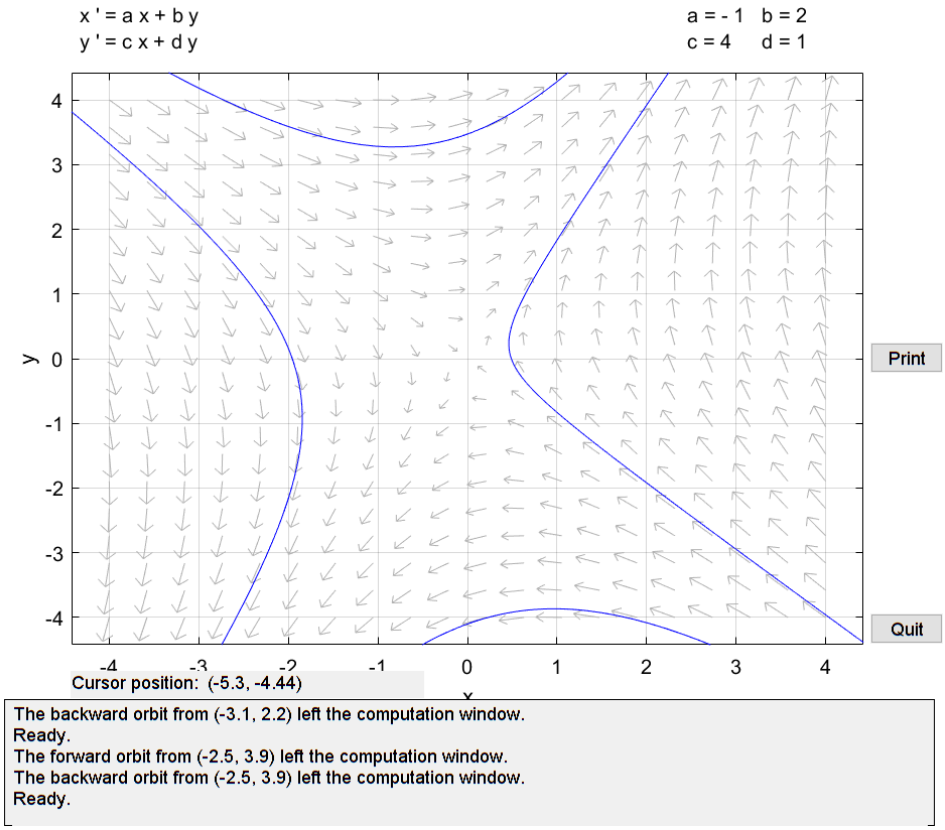

Figure 3: Saddle

At the origin there is a saddle steady state. We can determine this because the trajectories are not originating to or from the origin and trajectories start heading towards the origin, but never intersect it and then head outward from the origin.

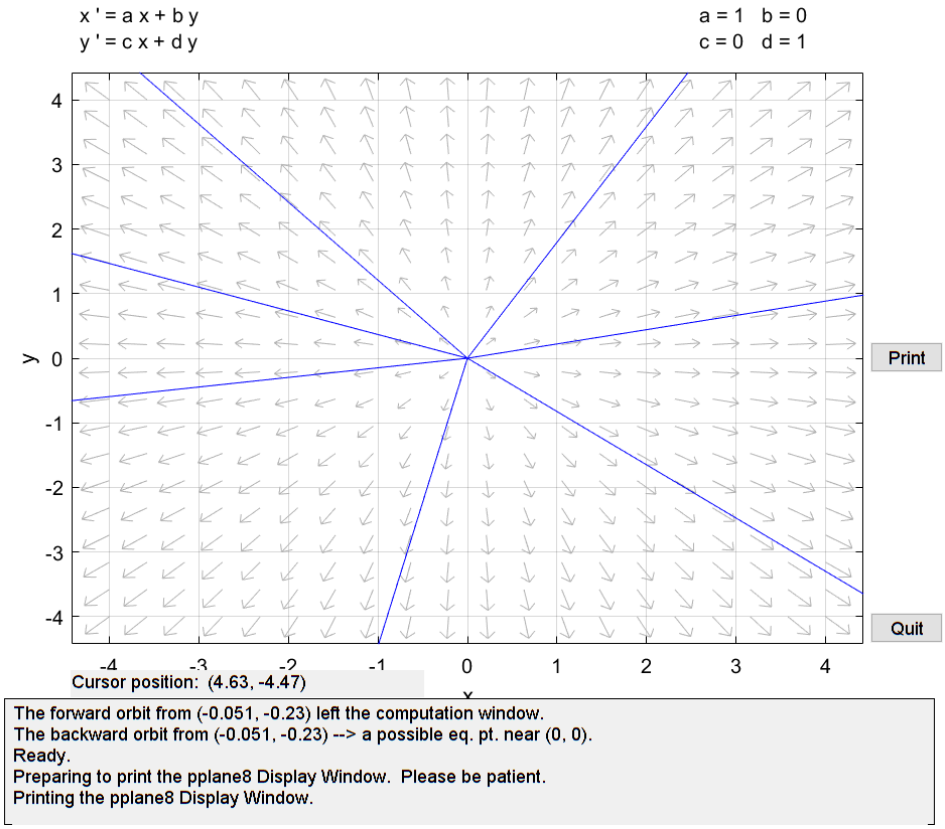

Figure 4: Source

At the origin there is a source/unstable steady state. We can determine this because the trajectories all originate from the origin and head outwards infinitely, with no specific convergence point.

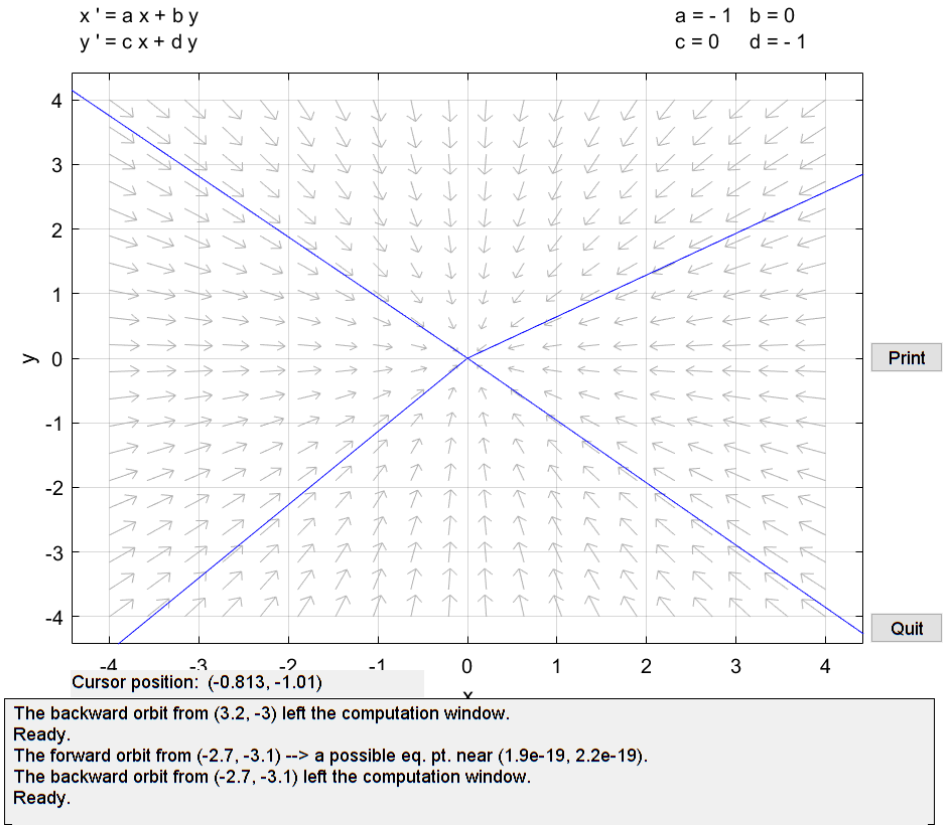

Figure 5: Sink

At the origin there is a sink/stable steady state. We can determine this because the trajectories all do not originate from the origin, but all head towards it.