CCEES Exercise Sheet 1

3. Three-Dimensional Dynamical System

Imagine a 3d-system with a fixpoint that is oscillatory and unstable.

(a) The oscillation must involve a two-dimensional subspace. How is it determined?

To determine the subspace, we can choose the fixpoint with a small perturbation as initial condition (it is unstable, so the perturbation will initially grow in time) and then look at the state the system evolves to.

(b) What are the possibilities for the remaining subspace?

Trajectories starting in the rest of space (not on the 2D-subspace) must either diverge or approach the 2D limit cycle.