[mex7] 2D Phase Portrait I

Consider the dynamical system characterized by the following equation of motion:

$$\ddot{x} - \dot{x}^2 + x^2 - x = 0.$$

(a) Identify all fixed points in the plane $(x, \dot{x})$ and determine the type of each fixed point.
(b) Identify the lines of vertical and horizontal isoclines.
(c) Plot the phase portrait of this dynamical system including isoclines. Identify the fixed points in the graph. Use Mathematica StreamPlot or equivalent.

Solution: