

6. [12 points] Consider the nonlinear system

$$x' = 1 - y, \quad y' = 2 - 2y + 3 \sin(x).$$

Sketch a qualitatively accurate phase portrait showing representative trajectories, by doing appropriate linearization and local analysis. Use your phase portrait to predict the behavior of a trajectory starting at $x(0) = \pi$, $y(0) = 0$.