Sample exam 3.

Open book, open notes, no calculators, no cooperation.

1. Solve the phase plane equation for the system \( \frac{dx}{dt} = x^2 - 2y^{-3}, \frac{dy}{dt} = 3x^2 - 2xy.\)

2. Find all the critical points of the system \( \frac{dx}{dt} = y^2 - 3y + 2, \frac{dy}{dt} = (x-1)(y-2).\)

3. Find a general solution to the system \( x' = x - y, y' = y - 4x.\)

4. Solve the initial value problem \( x' = 4x + y, y' = -2x + y, x(0) = 1, y(0) = 0.\)

5. Solve the phase plane equation for \( x' = 3/y, y' = 2/x,\) and sketch several representative trajectories with their orientation.