Math 341 Exam 3 May 12, 2003

1. (25) Let $A = \begin{pmatrix} 3 & 1 & -1 \\ 0 & 2 & 4 \\ -1 & -1 & -1 \end{pmatrix}$ which has characteristic polynomial $\lambda(\lambda-2)^2$. Find all solutions to $y' = Ay$.

2. (25) Solve the system $x' = 3x + 2y$, $y' = -x + y$, $x(0) = 1$, $y(0) = 0$. Give a rough sketch of the resulting orbit.

3. (25) Find all stationary points of $x' = x - x^3 + xy(x-1)$, $y' = -2y$ and sketch the orbits near each stationary point. For full credit your sketches should account for the eigenvectors. Comment on the stability near each stationary point. For 5 points extra credit, draw a plausible global sketch of the orbits in a region of the xy plane including all your stationary points.

4. (25) Find all solutions to $x' = x + y + 1$, $y' = 2x + 2y + e^t$.