MATH 252 - Problem Set 7

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This problem set is a collection of problems from all three sections. You should be sure to practice all three types both during class and at home, as there will likely be one of each on the quizzes and exams that are coming up. My recommendation for these problems is that you do one or two at first in groups, then move on to try one on your own. After that, explain to you group members how you did the problem and what the answer is. As a reminder, the general procedure for these problems is:

1. Find the eigenvalues and eigenvectors of the coefficient matrix.

2. Write out the solution in the form:

   - $k_1 e^{\lambda_1 t} \vec{v}_1 + k_2 e^{\lambda_2 t} \vec{v}_2$ for real eigenvalues
   - $e^{\lambda t} v_1$ for complex eigenvalues
   - or $\vec{v}_1 e^{\lambda t} + \vec{v}_2 t e^{\lambda t}$ for repeated roots.

3. If the eigenvalues are complex, split the solution into its real and imaginary parts, and write those as two independent solutions with constants k_1 and k_2.

4. Then determine constants to meet initial conditions. For repeated roots, $\vec{v}_1$ is the initial condition, and $\vec{v}_2$ is determined by $\vec{v}_2 = (A - \lambda I)\vec{v}_1$.

You should also be able to draw phase portraits for all of these systems. You should do those as a part of solving these problems.

Problems

1. Section 3.3, Problems 1-11 odd, 19

2. Section 3.4, Problems 1-15 odd

3. Section 3.5, Problems 1-10