

November 13, 2009

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**Your Name:****SCORE:** /10

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**INSTRUCTIONS:** Answer the following short-answer questions (in 10 minutes).**GOAL:** This reading quiz is designed to illuminate your understanding of the concepts in Chapter 3 of the book: General Solution to a 2-D Linear Systems, Phase Planes for Linear Systems with Real Eigenvalues, Complex Eigenvalues, A Zero Eigenvalue and Repeated Eigenvalues, Second-Order Linear Equations.

1. (10 points.) Write down examples of five differential equations of the form  $\frac{d\vec{x}}{dt} = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \vec{x}$  (where  $a, b, c$  and  $d$  are real numbers) that have qualitatively different phase portraits from each other. Describe the equilibrium point and provide a (very rough) little sketch (with arrows!) of the phase portrait of each of your linear systems of ODEs. **For each example, explain how you know how (i.e. what information you use) to classify your given examples in the way that you have.**

(A)

(B)

(C)

(D)

(E)

**BONUS** (2 points.) Provide some thoughts about the course project. What are your biggest apprehensions (fears) or concerns about the project? What information or assistance could I provide you in helping you to address these concerns?