

Math 211: Ordinary Differential Equations
Instructor: Qiongling Li
Midterm 2
Summer 2012

Please print name:

When you are finished with the exam, please sign the honor code below.
On my honor, I have neither given nor received any unauthorized aid on this exam:

This exam is intended to be taken in 2 hours, but if you really need more time, you can still use 30 minutes more. No books, notes or any other form of aid is permitted. There are 100 possible points. You must show all of your work, justifying when necessary. Partial credit will be given.

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Total	

(#1: 15 points) Find general solution of the system $\mathbf{x}' = A\mathbf{x}$,

where $A = \begin{pmatrix} 1 & 2 \\ -1 & 4 \end{pmatrix}$ and sketch the phase portrait. (Please try to be more precise.)

(#2: 15 points) Find general solution of the system $\mathbf{x}' = A\mathbf{x}$,

where $A = \begin{pmatrix} -1 & -2 \\ 4 & 3 \end{pmatrix}$ and sketch the phase portrait. (Please try to be more precise.)

(#3: 15 points) Find general solution of the system $\mathbf{x}' = A\mathbf{x}$,

where $A = \begin{pmatrix} 5 & 1 \\ -4 & 1 \end{pmatrix}$ and sketch the phase portrait. (Please try to be more precise.)

(#4: 10 points) Find the solution of the system $A\mathbf{x} = \mathbf{b}$,
where $A = \begin{pmatrix} -2 & -2 & -4 \\ 6 & 8 & 18 \\ 4 & 2 & 5 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 2 \\ 4 \\ 0 \end{pmatrix}$.

(#5: 15 points) Find a basis for $\text{Span}\{v_1, v_2, v_3\}$,
where $v_1 = \begin{pmatrix} 0 \\ -2 \\ 2 \end{pmatrix}$, $v_2 = \begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix}$, $v_3 = \begin{pmatrix} -2 \\ -3 \\ 4 \end{pmatrix}$.

(#6: 10 points) Find general solutions for $y''' - y' = 0$.

(#7: 12 points) Is the matrix $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 1 & 2 & 0 \end{pmatrix}$ singular or not?

(#8: 8 points) Check whether the following set of solutions of the system $\mathbf{y}' = A\mathbf{y}$ are linear dependent or not?

$$\mathbf{y}_1(t) = \begin{pmatrix} -e^{-t} \\ -e^{-t} \\ e^{-t} \end{pmatrix}, \mathbf{y}_2(t) = \begin{pmatrix} 0 \\ -e^t \\ 2e^t \end{pmatrix}, \mathbf{y}_3(t) = \begin{pmatrix} e^{2t} \\ 0 \\ 2e^{2t} \end{pmatrix}.$$