Assignment-9 of MATH 3270A
November, 2015

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1.
$$\mathbf{x}' = \begin{pmatrix} 2 & 3 \\ -1 & -2 \end{pmatrix} \mathbf{x} + \begin{pmatrix} e^t \\ t \end{pmatrix}$$

3.
$$\mathbf{x}' = \begin{pmatrix} 2 & 1 \\ -5 & -2 \end{pmatrix} \mathbf{x} + \begin{pmatrix} -\cos t \\ \sin t \end{pmatrix}$$

5.
$$\mathbf{x}' = \begin{pmatrix} 4 & 8 \\ -2 & -4 \end{pmatrix} \mathbf{x} + \begin{pmatrix} t^{-3} \\ -t^{-2} \end{pmatrix}$$

7.
$$\mathbf{x}' = \begin{pmatrix} 1 & 4 \\ 1 & 1 \end{pmatrix} \mathbf{x} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} e^t$$

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(a) Find the eigenvalues and eigenvectors.
(b) Classify the critical point $(0,0)$ as to type, and determine whether it is stable, asymptotically stable, or unstable.
(c) Sketch several trajectories in the phase plane, and also sketch some typical graphs of x_1 versus t.
(d) Use a computer to plot accurately the curves requested in part (c).

1.
$$\frac{d\mathbf{x}}{dt} = \begin{pmatrix} 3 & 2 \\ -2 & -2 \end{pmatrix} \mathbf{x}$$

3.
$$\frac{d\mathbf{x}}{dt} = \begin{pmatrix} 2 & 3 \\ -1 & -2 \end{pmatrix} \mathbf{x}$$

7.
$$\frac{d\mathbf{x}}{dt} = \begin{pmatrix} 3 & 4 \\ -2 & -1 \end{pmatrix} \mathbf{x}$$

9.

$$\frac{d\mathbf{x}}{dt} = \begin{pmatrix} 3 & 1 \\ -4 & -1 \end{pmatrix} \mathbf{x}$$

12.

$$\frac{d\mathbf{x}}{dt} = \begin{pmatrix} 2 & -\frac{5}{2} \\ \frac{9}{5} & -1 \end{pmatrix} \mathbf{x}$$