

DIFERENTIAL EQUATIONS, CLASS EXERCISE 8

- (1) Compute the eigenvalues and the eigenvectors of the matrix A

$$A = \begin{pmatrix} -1 & 0 & 0 \\ 0 & 1 & 2 \\ 0 & 2 & 1 \end{pmatrix}.$$

- (2) Compute the eigenvalues and the eigenvectors of the matrix B

$$B = \begin{pmatrix} 1 & 2 \\ -1 & -1 \end{pmatrix}.$$

- (3) Solve the initial value problem $\mathbf{x}'(t) = A\mathbf{x}(t)$,

$$A = \begin{pmatrix} -1.5 & 0.5 \\ 1 & -1 \end{pmatrix}, \quad \mathbf{x}(0) = \begin{pmatrix} 5 \\ 4 \end{pmatrix}$$

Draw the phase portrait of this linear system of DE's emphasizing the particular trajectory selected by the initial conditions.

- (4) a) Solve the initial value problem $\mathbf{x}'(t) = A\mathbf{x}(t)$,

$$A = \begin{pmatrix} 4 & -5 \\ -2 & 1 \end{pmatrix}, \quad \mathbf{x}(0) = \begin{pmatrix} 8 \\ 1 \end{pmatrix}$$

Draw the phase portrait of this linear system of DE's emphasizing the particular trajectory selected by the initial conditions.

- (5) Determine the general solution of $\mathbf{x}'(t) = A\mathbf{x}(t)$,

$$A = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{pmatrix}.$$