DIFERENTIAL EQUATIONS, CLASS EXERCISE 10

(1) Compute the matrix $\cos \pi A$ with

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

(2) Determine the general solution of the system of linear DE's

$$\mathbf{x}' = \begin{pmatrix} 3 & -18 \\ 2 & -9 \end{pmatrix} \mathbf{x}.$$

Sketch its phase portrait.

(3) Determine the solution of the IVP

$$\mathbf{x}' = \begin{pmatrix} 6 & 1 \\ 4 & 3 \end{pmatrix} \mathbf{x} + \begin{pmatrix} 6t \\ -10t + 4 \end{pmatrix}, \quad \mathbf{x}(0) = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$$

by using diagonalization.

(4) Determine the general solution of the nonhomogeneous system of DE's

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

by using the method of variation of parameters.