

Practice Problems

1. Find the determinant of the following matrices

$$\mathbf{A} = \begin{pmatrix} 21 & -43 & 97 \\ 0.1 & -9.3 & 0.8 \\ 0.3 & -16 & 22.7 \end{pmatrix} \quad \mathbf{B} = \begin{pmatrix} -65 & 31.1 & -83 & -13.2 \\ -14.5 & 1.6 & -6.4 & 48.9 \\ -10.5 & 54.8 & -67.7 & 92.3 \\ 20.8 & -9.9 & -14.8 & 42.1 \end{pmatrix}$$

2. Find the orthonormal basis of the following matrices

$$\mathbf{A} = \begin{pmatrix} 21 & -43 & 97 \\ 0.1 & -9.3 & 0.8 \\ 0.3 & -16 & 22.7 \end{pmatrix} \quad \mathbf{B} = \begin{pmatrix} -65 & 31.1 & -83 & -13.2 \\ -14.5 & 1.6 & -6.4 & 48.9 \\ -10.5 & 54.8 & -67.7 & 92.3 \\ 20.8 & -9.9 & -14.8 & 42.1 \end{pmatrix}$$

$$\mathbf{C} = \begin{pmatrix} 32.1 & -9.3 & -12.7 \\ 56.1 & -27.9 & 83.2 \\ -90.1 & 2 & 55 \end{pmatrix} \quad \mathbf{D} = \begin{pmatrix} -11.4 & -17.2 & -48.9 & -12.6 \\ -32.5 & -90.9 & -15.8 & -43.3 \\ -12.9 & 6.8 & -41.7 & 83.9 \\ 0 & -40 & -20 & 46.6 \end{pmatrix}$$

3. Diagonalize the following matrices

$$\mathbf{A} = \begin{pmatrix} 1 & 4 & -1 & 21 \\ 4 & 8 & 13 & -3 \\ -1 & 13 & 17 & -5 \\ 21 & -3 & -5 & 2 \end{pmatrix}$$

$$\mathbf{B} = \begin{pmatrix} -2 & 91 & -1 & 2 \\ 9 & -3 & 3 & 31 \\ -1 & 3 & -4 & 54 \\ -2.1 & 51 & 5 & -5 \end{pmatrix}$$

$$\mathbf{C} = \begin{pmatrix} -13.1 & 9.2 & -1.3 & 2.4 \\ 5.9 & -6.3 & 3.7 & 1.8 \\ 9.1 & 10.3 & 14.1 & 51.5 \\ 16.2 & -11.7 & -18.5 & 91.5 \end{pmatrix}$$

4. Convert these second order ODEs into systems of first order ODEs and use MATLAB to plot the solution.

$$3y'' + y' - y = 0, \quad y(0) = 2.1, \quad y'(0) = -4.4$$

$$y'' + y = 0, \quad y(0) = 2, \quad y'(0) = 3 \quad \leftarrow \text{What function is this?}$$

$$y'' - 2y' + = \frac{e^t}{t^2 + 1}, \quad y(0) = -4, \quad y'(0) = -1$$