MATH 3J04: Home Assignment # 2

Due to: October 10, 2000

Note: Numbers for problems refer to the main textbook, e.g. problem 7.1: #14 stands for exercise # 14 from section 7.1. Screen or graphical outputs of computer programs such as Matlab programs are allowed provided they are accompanied by clear explanation and details of the method.

Problem 3.3 #8: Find a real general solution of the system:

$$\begin{aligned} y_1' &= -3y_1 - y_2 + 2y_3, \\ y_2' &= -4y_2 + 2y_3, \\ y_3' &= y_2 - 5y_3. \end{aligned}$$

Problem 3.3 #14: Solve the initial value problem for the system:

$$\begin{aligned} y_1' &= 2y_1 + 3y_2, \\ y_2' &= \frac{1}{3}y_1 + 2y_2, \\ y_1(0) &= 0, \quad y_2(0) = 2. \end{aligned}$$

Problem 3.4 #8: Determine the type and stability of the critical point. Then find a real general solution of the system:

$$\begin{aligned} y_1' &= -y_1 + 4y_2, \\ y_2' &= 3y_1 - 2y_2. \end{aligned}$$

Problem 3.5 #8: Determine the location and type of all critical points of the differential equation:

$$\frac{d^2y}{dt^2} + y - y^3 = 0$$

Problem 18.8 #6: Use power method with scaling of eigenvectors to find an approximation for dominant eigenvalue (show 3;5;10 iterations):

$$\begin{pmatrix} 2 & 4 & 0 & 1 \\ 4 & 1 & 2 & 8 \\ 0 & 2 & 5 & 2 \\ 1 & 8 & 2 & 0 \end{pmatrix}$$

Problem 18.9 #8: Use QR-factorization algorithm to compute eigenvalues of the matrix (show 3;5;10 iterations):

$$\begin{pmatrix} 14.2 & -0.1 & 0 \\ -0.1 & -6.3 & 0.2 \\ 0 & 0.2 & 2.1 \end{pmatrix}$$