Homework I, Introduction to Mathematical Systems Theory, 2001/2002

Hand out: December 21th

Hand in: January 11th

- It is allowed to discuss the problems with other students.
- Corporation in groups of two people of approximately the same level is allowed.
- Everybody hands in his or her own version. If applicable include Maple code.
- It is not allowed to copy from each other.

The numbers refer to the exercises in the book.

- 1. Exercises 2.3, 2.5, 2.25
- 2. Exercise 3.25 (optional, correct solutions will obtain *bonus points*)
- 3. Consider the matrix

$$P(\xi) = \begin{bmatrix} \xi^4 & \xi^7 - \xi^6 - \xi^5 - 2\xi^4 - \xi^2 - \xi + 2 & -\xi^6 + \xi + 2 \\ \xi^2 & \xi^5 - \xi^4 - \xi^3 - 2\xi^2 & -\xi^4 \\ \xi^3 + 2\xi^2 & \xi^6 + \xi^5 - 3\xi^4 - 5\xi^3 - 4\xi^2 + 4\xi & -\xi^5 - 2\xi^4 + \xi^2 + \xi - 2 \end{bmatrix}$$

- (a) Use Theorem 3.2.16 to determine the behavior of $P(\frac{d}{dt})w = 0$. Notice that (3.20) takes a rather simple form for the multiplicity-two-case.
- (b) Transform $(P(\xi))$ into diagonal form. Use Maple and clearly indicate which row and column operations you applied.
- $4. \ 3.36$