## 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

$$
P(\xi)=\left[\begin{array}{ccc}
\xi^{4} & \xi^{7}-\xi^{6}-\xi^{5}-2 \xi^{4}-\xi^{2}-\xi+2 & -\xi^{6}+\xi+2 \\
\xi^{2} & \xi^{5}-\xi^{4}-\xi^{3}-2 \xi^{2} & -\xi^{4} \\
\xi^{3}+2 \xi^{2} & \xi^{6}+\xi^{5}-3 \xi^{4}-5 \xi^{3}-4 \xi^{2}+4 \xi & -\xi^{5}-2 \xi^{4}+\xi^{2}+\xi-2
\end{array}\right]
$$

(a) Use Theorem 3.2.16 to determine the behavior of $P\left(\frac{d}{d t}\right) w=0$. 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

