

Hand in before Friday 1 June

Allowed formats: handwritten or printed or pdf [pdf by email]

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Problems for chapters 1, 2, 3, 4, 8.1-8.2, 9

1. Chapter 2: Consider $\mathbb{R}^3$ and its subspace

$$\mathbb{V} = B\mathbb{R}^3, \quad B = \begin{bmatrix} 1 & 2 & 5 \\ 2 & -1 & 0 \\ 1 & 4 & 9 \end{bmatrix} \quad (1)$$

- Determine $\mathbb{V}^\perp$
 - Determine (nonunique) matrices A and W of minimal dimensions such that $\mathbb{V} = \text{im}(A) = \ker(W)$. [Minimality is defined in Lemma 2.5.3]
 - For ugly matrices $B \in \mathbb{R}^{n \times m}$ finding minimal A and W can be tricky. Explain how the (numerical) QR-factorization of B can help in finding both minimal A and minimal W without inversion of matrices. Use MATLAB to determine minimal A and W by QR-factorization of the B in (1)
- Prove Theorem 2.6.3
 - Problem 2.8
 - Problem 2.9
 - Problem 3.6
 - Problem 3.7
 - Problem 3.19
 - Problem 4.1
 - Problem 4.7
 - Problem 4.9
 - Problem 8.1 [hand in the matlab code as well; this holds for any matlab exercise]
 - Problem 8.2
 - Problem 8.4. Take a really fine grid and explain the special structure of $A'A$ in the associated normal equations
 - Problem 9.1(b)
 - Prove Lemma 9.3.2 (in part 3, " $\gamma_n \geq 0$ " should be: " $\gamma_n > 0$ ")

Problem:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Points:	2+2+4	7	2	2+2+2	7	3+3+4	5	2+2+2+2	7	2+2+2+2	6	6	7	6	7

Total number of points = 100.