

LINEAR ALGEBRA 1
PROBLEM SHEET 1

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Problem 1 (10 points, Morgan's law). Prove the second Morgan's law, see Proposition 9(b).

Problem 2 (10 points, truth table). Compute the truth table for the following logical expression.

$$((p \wedge \neg q) \Rightarrow (r \wedge (q \vee p))) \Rightarrow ((p \wedge \neg r) \vee (q \vee p))$$

Problem 3 (5+5 points, row echelon form). Find a row echelon form for the matrix

$$(0.1) \quad \begin{pmatrix} 2 & 1 & 1 & 5 & 1 \\ 3 & 5 & -1 & 2 & 2 \\ 0 & 4 & 2 & 3 & 5 \\ 3 & 2 & 1 & 4 & 3 \end{pmatrix}.$$

Can you find the reduced row echelon form for (0.1)?

Problem 4 (10 points, linear system). Is there a linear system (with real variables) with exactly two solutions? Give a proof for your answer.

Date: Please hand in before the lecture by **11th of October 2023**. For all exercises the results need to be proven using results from this lecture and the lectures before, provided you give a reference.