

# Algebra III

2h lecture at TU Berlin, WS 2016/17, Prof. P. Bürgisser

## **Kap. 1. Ordered fields**

- 1.1 Real fields
- 1.2 Real closed fields
- 1.3 Counting real zeros (Descartes, Budan-Fourier, Sturm)

## **Kap. 2. Tarski-Seidenberg principle and consequences**

- 2.1 Quantifier elimination
- 2.2 Hilbert's 17th problem

## **Kap. 3. Real algebra**

- 3.1 Digression on commutative algebra
- 3.2 Real Nullstellensatz
- 3.3 Cones (or preorders) in commutative rings
- 3.4 Positivstellensatz
- 3.5 Schmüdgen's Positivstellensatz
- 3.6 Sums of squares and semidefinite optimization