

COMMUTATIVE ALGEBRA
EXERCISE SHEET 11

PROF. DANIEL SKODLERACK

Problem 1 ((Krull's intersection theorem) 10 points). Let R be a finitely generated algebra over a field. Show that its Jacobson radical is equal to the nil radical.

Problem 2 (10 points). Proof Proposition 143.

Problem 3 (10 points). Prove Corollary 142.

Problem 4 (10 points). Let $P(X_1, \dots, X_l)$ and $Q(X_1, \dots, X_l)$ be two polynomials over an algebraically closed field k . Suppose that all roots (in k^l) of P are roots of Q . Show that all irreducible divisors of P divide Q .

Date: Please hand in before the lecture on Thursday by **02.12.2021**. For all exercises the results need to be proven. You are allowed to use results from the Abstract Algebra course.