21. Assume $\text{char}(K) \neq 2$ and let $\Gamma \in M(n, K)$ with associated bilinear form $K^n \times K^n, (x, y) \mapsto x^t \Gamma y$, and $O(\Gamma)$ its isometry group. Show that the tangent space of $O(\Gamma)$ at $I = I_n$ is $T_I O(\Gamma) = \{ A \in M(n, K) \mid A^t \Gamma + \Gamma A = 0 \}$.

(Hint: use the Cayley transform $c(A) = (I + A)(I - A)^{-1}$ for $A \in M(n, K)$ with $\det(I - A) \neq 0$ and show that $c(A) \in O(\Gamma)$ if and only if $A^t \Gamma + \Gamma A = 0$.)

22. Compute the dimensions of $\text{SO}_n$ and $\text{Sp}_n$.

23. Assume $\text{char}(K) = 0$. Let $G$ be a linear algebraic group, all of whose elements have finite order. Show that $G$ is finite.

24. For affine varieties $X$ and $Y$, show that $\dim(X \times Y) = \dim(X) + \dim(Y)$.

25. If $X$ is an irreducible affine variety and $Z \subset X$ a closed subvariety, prove $\dim(Z) < \dim(X)$.

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From Fachschaft Mathematik:

On November 18th, beginning at 18 o’clock the student council will host a plenary assembly for all math students. These topics will be discussed: interim mensa, improvements of examination regulations and local numerus clausus. Further information on these topics is available at the showcase in the auxiliary building as well as on fsmath.uni-bonn.de. Attend numerously!

Contact: David Ploog, room 1.002, dploog@uni-bonn.de
Lectures: Monday, 12.15, large lecture hall Wegelerstraße 10
           Thursday, 14.15, small lecture hall Wegelerstraße 10
Tutorials: Wednesday, 16.15 (Orlando); Friday, 12.30 (Tomasz)