31. Find a symmetric, non-degenerate bilinear form $\Gamma$ on $K^n$ such that $T := \text{SO}(\Gamma) \cap D_n$ is a torus of dimension $m$ if $n = 2m$ or $n = 2m + 1$. Prove that $T$ is a maximal torus in $\text{SO}(\Gamma)$: if $H \subseteq \text{SO}(\Gamma)$ is abelian with $T \subseteq H$, then $T = H$.

32. Compute the orbits of the natural actions of $\text{GL}_n, T_n, \text{U}_n, D_n$ on $\mathbb{A}^n$ and draw them for $n = 2$. Describe orbit closures as unions of orbits.

33. Show that the adjoint representation of $\text{SL}_2$ has disconnected isotropy groups.

34. Let $G$ be a unipotent linear algebraic group and $X$ an affine $G$-variety. Show that all orbits of $G$ in $X$ are closed.

35. For a homogeneous ideal $I \subseteq K[x_0, \ldots, x_n]$, geometrically compare the varieties $V(I) \subseteq \mathbb{A}^{n+1}$ and $V(I) \subseteq \mathbb{P}^n$. Prove the homogeneous Nullstellensatz.