11. Prove that the group $T_n$ of upper triangular matrices is solvable.

12. Show that $\mathbb{G}_a$ and $\mathbb{G}_m$ are not isomorphic as affine algebraic groups.

13. Let $\varphi: X \to Y$ be a morphism of affine varieties. Show that $\varphi$ is dominant (i.e. the image of $X$ is dense in $Y$) if and only if $\varphi^*: A(Y) \to A(X)$ is injective.

14. Let $H \subset \text{GL}_n$ be an arbitrary subgroup. Show that the Zariski-closure $\overline{H}$ is a linear algebraic group. Moreover, prove that closure preserves the following properties: $H$ commutative; $H$ solvable; $H$ unipotent.

15. Show that none of the following implications among properties of linear algebraic groups can be reversed:

\[
\begin{array}{cccc}
\text{unipotent} & \downarrow \\
\text{torus} & \iff & \text{diagonalisable} & \iff & \text{abelian} & \iff & \text{nilpotent} & \iff & \text{solvable}
\end{array}
\]