1. If $G = \text{Spec}(A)$ is an affine group scheme, and $I \subset A$ is an ideal such that $\text{Spec}(A/I)$ is a subgroup scheme of $G$, then show that $\text{Spec}(A/\sqrt{I})$ is also a subgroup scheme of $G$. Deduce that the set of $\overline{k}$-points of an algebraic subgroup scheme is the set of $\overline{k}$-points of a sub algebraic group. Hint: show that if $I$ is a Hopf ideal, then so is $\sqrt{I}$.

2. Assume $k = \overline{k}$ has char($k$) $\neq 2$.
(a) The group $O_n$ is not connected.
(b) Let $V$ be the set of skew symmetric $n \times n$ matrices. Show that $x \mapsto (1+x)^{-1}(x-1)$ defines an isomorphism of a non-empty open subset of $SO_n$ onto an open subset of $V$. Show that $SO_n$ is the identity component of $O_n$.

3. Let $G$ be a connected algebraic group and let $N$ be a finite normal subgroup. Show that $N$ lies in the center of $G$. Hint: for $n \in N$ consider the map $x \mapsto xnx^{-1}$ of $G$ to $N$. 
