1. The emphasis should be on a clear and rigorous proof, hopefully also short!
There are $n$ people in the room, some know each other and some don’t. If $i$ knows $j$, then $j$ knows $i$. Suppose that for every four different people there exists one who knows the remaining three.
A person who knows all the rest is called “connected”.
   a) Prove that there exists a “connected” person.
   b) Prove that at least $n - 3$ people are “connected”.

2. Show an enumeration of all TMs with the property that for every TM $M$ there exists a constant $\alpha, \alpha(M) > 0$ and a number $N$ such that for all $n \geq N$, $\alpha$ fraction of the strings of length $n$ represent $M$.

3. Describe a TM for palindromes, that is, given an input $x$ decides whether $x$ is a palindrome or not.

4. Show that if $T1, T2$ are time constructible functions then so are:
   a) $T1 + T2$
   b) $T1 \cdot T2$

5. Show that every language $L$ is contained in $SIZE(O(n \cdot 2^n))$, that is, can be solved by a family of circuits of size $O(n \cdot 2^n)$. 