Word Equations: Sheet 7

Task 1 Show that the approximation algorithm for the smallest grammar problem using the recompression approach returns an SLP of size $\mathcal{O}(g' \log n)$, where g' is the size of the smallest grammar in which we additionally allow rules of the form $A \to B^\ell$, that have size 1.

Task 2 Let SLP $\mathcal{G}$ contain no production $X \to \alpha$ with $|\alpha| \leq 1$ and assume that every production is used in the derivation defined by $\mathcal{G}$. Then $|\mathcal{G}| \leq 2|\operatorname{val}(\mathcal{G})| - 1$.

Task 3 Show that the computation of SLP by the recompression based approach can be divided into two phases, in first the issued credit is $\mathcal{O}(g + g \log(n/g))$ and in the second the representation cost is at most $\mathcal{O}(g)$.
Hint[1]

[1]For the second part, using the exercise above. For the first, try to find appropriate moment in the computation so that it fits the later analysis.