$2\frac{1}{2}$

where * represents a linear combination of base elements of the form $y_1^{j_1} y_2^{j_2} \cdots y_s^{j_s} \times y_1^{l_1} y_2^{l_2} \cdots y_t^{l_t}$ with $\sum l_i > 1$. The second through the $(m+1)$st term do not occur in expressions of this type for any other base element $y_1^{j_1} y_2^{j_2} \cdots y_s^{j_s}$. It follows that in order that $a\delta$ shall be a linear combination of the base elements of the form $y_1^{k_1} \cdots y_m^{k_m} \times 1$ and $1 \times y_1^{j_1} \cdots y_s^{j_s}$, it is necessary that in the expression for a in terms of the chosen basis only base elements $y_1^{k_1} \cdots y_m^{k_m}$ with $k_i = 1$ and all the other $k_j = 0$ occur with non-zero coefficient. Hence a is a linear combination of the y_i hence $a \in L$, hence $a\delta = a \times 1 + 1 \times a$ iff $a \in L$

Now we can prove that $\log(1+Z)$ is a Lie element

$$e^A e^B \delta = e^A \delta\, e^B \delta$$
$$= e^{(A \times 1 + 1 \times A)} e^{(B \times 1 + 1 \times B)}$$
$$= e^{A \times 1} e^{1 \times A} e^{B \times 1} e^{1 \times B}$$
$$= (e^A \times 1)(1 \times e^A)(e^B \times 1)(1 \times e^B)$$
$$= (e^A \times 1)(e^B \times 1)(1 \times e^A)(1 \times e^B)$$
$$= (e^A e^B \times 1)(1 \times e^A e^B)$$

Hence
$$(\log(1+Z))\delta = \log((1+Z)\delta)$$
$$= \log((1+Z) \times 1) + \log(1 \times (1+Z))$$
$$= \log(1+Z) \times 1 + 1 \times \log(1+Z)$$

$\therefore \log(1+Z) \in L$

Define the mapping σ by $A\sigma = A$, $B\sigma = B$

if $x_i \in \{A, B\}$, $(x_1 x_2 \cdots x_m)\sigma = [\ldots[x_1, x_2] \cdots x_m]$. This mapping is linear. We prove:

A homogeneous element a of degree $m > 0$ is a Lie element iff $a\sigma = ma$ where