Matrix Analysis Homework 6, Problem 7.14 (4)

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(4) Let $P(X) \in K[X]_{\leq m}$. Then

$$
\begin{aligned}
L_i^*(P) &= L_i^*(P(\alpha_1)L_1 + \cdots + P(\alpha_{m+1})L_{m+1}) \\
&= P(\alpha_1)L_i^*(L_1) + \cdots + P(\alpha_{m+1})L_i^*(L_{m+1}) \\
&= P(\alpha_i)
\end{aligned}
$$

for all $1 \leq i \leq m+1$.