Solution to *B.5-3*

Let n, n_0, n_2 be the total number of nodes, the number of leaves, and the number of degree-2 nodes in any binary tree, respectively. If $n = 1$, then there's only the root in the binary tree, and we have $n_0 = 1$, $n_2 = 0$. Therefore, $n_2 = n_0 - 1$.

Suppose that $n_2 = n_0 - 1$ holds for any binary tree of size n where $n \geq 1$. Let's add a new node to the tree making the size be $n' = n + 1$. If the new node is appended to a leaf in the original tree, then the number of degree-2 nodes is $n'_2 = n_2$, the number of leaves is $n'_0 = n_0$ and of course we have $n'_2 = n'_0 - 1$ since $n_2 = n_0 - 1$. Otherwise if the new node is appended to a degree-1 nodes in the original tree, then we have $n'_2 = n_2 + 1$, $n'_0 = n_0 + 1$ and still we have $n'_2 = n'_0 - 1$.