CSC236 tutorial exercises, Week #4

Here are your tutorial sections:

Surname	Time	Room	TA
A–K	Friday 11	SS1088	Zhaowei
L–Tg	Friday 11	SS2105	Hamed
Th–Z	Friday 11	BA2175	Gal
A–L	Friday noon	AB114	Wen
M–Z	Friday noon	BF323	Lauren
A–K	Friday 1	BA1170	Ammar
L–Tg	Friday 1	AB107	Alex
Th–Z	Friday 1	AB114	Shems
A–K	Thursday 8	BA2139	Zach
L–Tg	Thursday 8	BA2185	Ekansh
Th–Z	Thursday 8	BA2195	Danniel

These exercises are intended to give you practice with complete induction.

1. Define the set of expressions $\mathcal{E}$ as the smallest set such that:

   (a) $x, y, z \in \mathcal{E}$.

   (b) If $e_1, e_2 \in \mathcal{E}$, then so are $(e_1 + e_2)$ and $(e_1 \times e_2)$).

   Define $p(e)$: Number of parentheses in e.

   Define $s(e)$: Number of symbols from $\{x, y, z, +, \times\}$ in e, counting duplicates.

   Use structural induction to prove that for all $e \in \mathcal{E}$, $p(e) = s(e) - 1$.

2. Define the set of non-empty full binary trees, $\mathcal{T}$, as the smallest set such that:

   (a) Any single node is an element of $\mathcal{T}$.

   (b) If $t_1, t_2 \in \mathcal{T}$, then so is any root node with edges to t_1 and t_2.

   Use structural induction to prove that any non-empty full binary tree has an odd number of nodes.