4.5) Base case: $h=0$ Ⓐ 1 node $maxNodes(0) = 2^{0+1}-1 = 2-1 = 1$ ✓

Inductive Hyp: Assume thm holds for all $0 \le h \le k$

$h=k=0$ $h=k+1=1$

$maxNodes(0) = 2^{0+1}-1 = 2-1 = 1$

$2^{k+1}-1 = 2^k \cdot 2 - 1$ $maxNodes(k+1) = 2^{1+1}-1 = 4-1 = 3$ $2^k \cdot 2 - 1 = 2^k \cdot 2$

Definition of Exponents $2^{(k+1)+1}-1 = 2^{k+1} \cdot 2 - 1 = 2^k \cdot 2 \cdot 2 - 1$ $maxNodes(k) = 2^k \cdot 2 - 1 \overset{?}{=} 2^k \cdot 2$

$= 2(2^k \cdot 2) - 1$ $maxNodes(k)+1 = (2^k \cdot 2 \cancel{-1}) \cancel{+1} \overset{\checkmark}{=} 2^k \cdot 2$

By Inductive Hyp, the right side becomes $(maxNodes(k)+1) \cdot 2 - 1$

$maxNodes(k+1) \overset{?}{=} (MaxNodes(k)+1) \cdot 2 - 1$

$3 = (1+1) \cdot 2 - 1$

3=2*2-1

3=4-1

3=3

QED