

1. Prove that for all reals $a \neq 1$,

$$\sum_{i=0}^n a^i = \frac{a^{n+1} - 1}{a - 1}$$

2. Prove that for all reals a and positive integers b ,

$$(n + a)^b \in \Theta(n^b)$$

3. Prove or disprove: If $f(n) \in O(g(n))$ then $2^{f(n)} \in O(2^{g(n)})$
4. Prove that at the termination of the stable marriage algorithm, no 2 men will be matched to women of their last choices.