

# Assignment 2

## 1.1 Are either $2^{n+1}$ or $2^{2n}$ big- $O$ of $2^n$ ?

The former is, the latter is not. Suppose  $2^{n+1} = O(2^n)$ , then  $2 \cdot 2^n \leq c \cdot 2^n$  as  $n \rightarrow \infty$ ; this is obviously true for all  $c \geq 2$ .

Regards to whether  $2^{2n} = O(2^n)$ , consider the inequality  $2^{2n} \leq c \cdot 2^n$ . This is equivalent to saying  $2^n \cdot 2^n \leq c \cdot 2^n$ . Dividing both sides by  $2^n$  gives  $2^n \leq c$ , which is obviously false (the exponential function is not constant bound).