

**CS 410/586: Quiz 2, 6 April 2009 Name: \_\_\_\_\_ KEY \_\_\_\_\_**

No books or notes. Work individually.

Question 1 (3 points): Is

$$f(n) = 2 + 2^n \text{ in } O(2^n)?$$

Explain why or why not.

*Yes. If we pick  $c = 2$ , then  $2 + 2^n \leq c2^n$  for  $n \geq 1$ .*

Question 2 (3 points): Is

$$f(n) = 2 \cdot 2^n \text{ in } O(2^n)?$$

Explain why or why not.

*Yes. If we pick  $c = 2$ , then  $2 \cdot 2^n \leq c2^n$  for all  $n$ .*

Question 3 (4 points): Is

$$f(n) = (2^n)^2 \text{ in } O(2^n)?$$

Explain why or why not.

*No. Suppose there were a value for  $c$  such that  $(2^n)^2 \leq c2^n$  for all  $n \geq n_0$ . Then we must have  $2^n \leq c$  for all such  $n$ . But this inequality fails for all  $n > \log_2 c$ .*