

Homework Assignment #4
Due: October 8, 2015 at 4:00 p.m.

1. Is $\sqrt{\log n} \in O(\log \sqrt{n})$? Prove your answer is correct.
2. Is $n! \in O(2^n)$? Prove your answer is correct.
3. Willemina has devised a recursive algorithm. Let $T(n)$ be the worst-case running time of her algorithm on inputs of size n . Willemina determines that $T(n)$ satisfies the following relations.

$$T(1) = 3,$$

$$T(2) = 7, \text{ and}$$

$$T(n) \leq T(\lfloor n/2 \rfloor) + T(\lceil n/6 \rceil + 1) + 3n, \text{ for } n \geq 3$$

- (a) What is $\max\{T(n)/n : 1 \leq n \leq 200\}$? You do not have to prove your answer is correct.
- (b) Give a careful proof that $T(n) \in O(n)$.
Hint: The Master Theorem does not apply to T .