CS330 - Recurrence Relation Problems

1. Solve the recurrence relation $T(n) = T(n-1) + 4, T(1) = 2$ and prove your result is correct by induction. What is the order of growth?

2. Solve the recurrence relation $T(n) = T(n-1) + n, T(1) = 1$ and prove your result is correct by induction. What is the order of growth?

3. Solve the recurrence relation $T(n) = 2T(n/2) + n, T(1) = 1$ and prove your result is correct by induction. What is the order of growth?

4. I will give you a shortcut for solving recurrence relations like the previous problem called the Master Theorem. Suppose $T(n) = aT(n/b) + f(n)$ where $f(n) = \Theta(n^d)$ with $d \geq 0$. Then $T(n)$ is:

   - $\Theta(n^d)$ if $a < b^d$
   - $\Theta(n^d \lg n)$ if $a = b^d$
   - $\Theta(n^{\log_b(a)})$ if $a > b^d$

   Use the Master Theorem to solve the previous problem, explaining what the values are for a, b and d, as well as the order of growth.