Due: Wednesday, November 16, end of day **My name**

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1. (6 points) Give a recursive definition for each of the following sequences $\{a_n\}$ for $n=1,2,3,\ldots$

(a)
$$a_n = 4n - 2$$

(b) $a_n = 1 + (-1)^n$ $(c) a_n = (\frac{1}{2})^n$ $(c) a_n = (\frac{1}{2})^n$ (c) a

(a) (4 points) What is ϵ : when ϵ (b) (4 points) Give a recursive definition of the reversal of a string.

(b) (6 points) Use structural induction to prove that $(w_1w_2)^R = w_2^R$.

(c) (6 points) Use structural induction to prove that $(w_1w_2)^R = w_2^Rw_1^R$.

3. (10 points) A palindrome is a string that reads the same forward and backward, i.e., $w = w^R$. Give a recursive algorithm in pseudocode that checks whether a given string w is a palindrome. What is the can possely be the in construct four right to strong + chick with the strong + chick with the strong of intetime complexity of your algorithm?

4. (10 points) Give a recursive algorithm in pseudocode that finds the maximum number among n integers. What is the time complexity of your algorithm?

5. An employee joined a company in 2015 with a starting salary of \$50,000. Every year this employee receives a raise of \$1000 plus 4% of the salary of the previous year.

• (3 points) Set up a recurrence relation for the salary of this employee n years after 2015.

• (4 points) Find an explicit formula for the salary of this employee n years after 2015.

• (3 points) What will the salary of this employee be in 2030?

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 $b_{c}(s) = 4 - 2 = 2$ c. $a_1 = (\frac{1}{2})^n$ (a) $a_n = 4n-2$ recurrence: $a_n = a_{n-1} + 4$

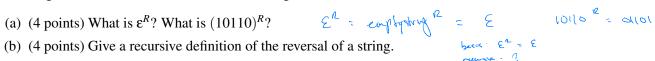
$$\frac{1}{2} \qquad \qquad \frac{1}{2}$$

(b) $a_n = 1 + (-1)^n$ $a_n = 1 + (-1)^n = 1 - 1 = 0$

recorpte:
$$a_N = a_{N-1} \cdot \frac{1}{2}$$

(c) $a_n = (\frac{1}{2})^n$ necessite: an = an-2

2. For string $w = a_1 a_2 \cdots a_n$, the reversal of the string is defined as $w^R = a_n \cdots a_2 a_1$.



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 - (a) (4 points) What is ε^R ? What is $(10110)^R$?
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