# Ars Digita University
# Theory of Computation
# Recitation 5 , 05/09/01

## Topics

- Decision Problems
- Context free grammars.

## Problems to work on

### Decision Problems

1. Finish the decision problems form the last recitation handout.

### CFG warmup

2. Give a context free grammar that generates the language of palindromes {w(0+1+epsilon)$w^R$ | w is in (0 + 1)*}
3. Give a context free grammar that generates every possible string over {0,1}
4. Give a context free grammar that generates the language $0^n1\ 0^n\ 111\ 0^m\ 1^r$ where n, m, r >= 0
5. Give a context free grammar that generates the language of all strings that contain 101.
6. Give a context free grammar that generates the language of all strings with an equal number of zeros and ones.

### And/Or

7. Give a context free grammar that generates the language that has equal numbers of 0's and 1's or contains 101.
8. Give a context free grammar that generates the language that has equal numbers of 0's and 1's and contains 101.

### Complements

9. Give a context free grammar that generates the language of all strings of the form $0^m1^n$ where n >= m >= 0.
10. Give a context free grammar that generates the language of all strings of the form $0^m1^n$ where n > m >= 0.
11. Give a context free grammar that generates the complement of the language 0*1*.
12. Give a context free grammar that generates the language { w | w is not equal to $0^n1^n$

for any choice of n}

13. Challenging problem: Give a context free grammar that generates the language { w | w is not a palindrome}

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