

CS 3133 Foundations of Computer Science, C term 2012

Homework 2, due Monday, January 30

READING: Chapters 3, 4, 5, 18.

1. Exercise 2 on page 97. (15 points)
2. Exercise 4 on page 98. (20 points)
3. Exercise 7 on page 98. (15 points)
4. Show by induction that for every natural number n , 3 is a divisor of $n^3 + 2n$. (15 points)
5. Let G be the grammar

$$\begin{aligned} S &\rightarrow ASB|\lambda \\ A &\rightarrow a \\ B &\rightarrow b. \end{aligned}$$

- (a) What is $L(G)$?
 - (b) Prove formally (so using induction on the length of the derivations) that $L(G)$ is the set given in (a). (20 points)
6. In this problem we consider the grammar of arithmetic expressions AE , so

$$\begin{aligned} AE : \quad V &= \{S, A, T\} \\ \Sigma &= \{b, +, (,)\} \\ P : \quad 1. &S \rightarrow A \\ &2. A \rightarrow T \\ &3. A \rightarrow A + T \\ &4. T \rightarrow b \\ &5. T \rightarrow (A) \end{aligned}$$

Build the search tree constructed by the breadth-first top-down parsing algorithm for the string $b + b$. (15 points)