CS 3133 Foundations of Computer Science, C term 2019

Homework 2, due Monday, January 28

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

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

   (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

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

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