600.471 Theory of Computation September 19, 2007

Handout 4: Homework 2

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This assignment is due by the start of lecture on Wednesday, September 26.

1. Show that the following languages are regular by giving FAs that recognize them or prove that they are not regular.
   (a) $A_0 = \{w \in \{0,1\}^* \mid \text{no prefix of } w \text{ has more 0's than 1's}\}$.
   (b) $A_1 = \{0^i \mid i \text{ is a prime number}\}$.[1]
   (c) $A_2 = \{a^i b^j c^k \mid i, j, k \geq 0 \text{ and if } i = 1 \text{ then } j = k\}$.
2. Book, 2.20. [context-free and regular languages]
3. Book, 2.22. [a context-free language]
4. Book, 2.28, part (b). [a CFG]
5. Are the following languages context-free? Justify your answers.
   (a) A_1 as given above.
   (b) $A_3 = \{0^i \mid i \text{ is a prime number less than } 2^{80}\}$.

[1] Note that this is written in unary, where $0^3 = 000$.