

Discrete Mathematics

368.115

Exercise sheet 6 for November 11, 2016

We will also discuss problems 2 and 3 of sheet 5.

The following problems are meant to be solved using GAP, which can be used online on the site <http://www.sagemath.org/>. In order to use GAP on this site, register, sign in, create a project, choose the button `>_ Terminal`, and type `gap` into the command line of this terminal. From the GAP command line that starts with `gap>`, load the automata package using `RequirePackage ("automata")`.

- (1) Let r be the rational expression $a \cup ((bbb)^*(bb)^*a)$. Find a DFA that recognizes $\text{Lang}(r)$. Use `AutToRatExp` to obtain a regular expression r_1 expressing the same language.

Hint: Use commands such as `r := RationalExpression ("aUa*");`
`A := RatExpToAut (r); AutToRatExp.`

- (2) Let r be the rational expression $(aaaaa)^*(aaa)^*$. Find a DFA recognizing $A^* \setminus \text{Lang}(r)$. List all words of this language! (These are those amounts that you cannot pay by a combination of coins that are worth 5 and 3 units.)

Hint: Use `CopyAutomaton`, `SetFinalStatesOfAutomaton`,
`FiniteRegularLanguageToListOfWords`.