

Prob. 1	Prob. 2	Prob. 3

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Problem 1.

- 1) First let's convert the DFA to an NDA  $A'$ , which is  $A$  with all state transitions reversed.
- 2) Convert  $A'$  to a DFA  $A''$  (using techniques we saw in class)
- 3) Compare  $A$  and  $A''$  (using the technique we saw in class, section 2.3 of lecture notes 5)
- 4) If they accept the same entries, accept, else reject.

## Problem 2.

Let's take the Turing-Machine recognizing  $C$ . And modify it to stop after  $x$ , not reading the rest of the input. As the language can recognize and decide  $C$ , it can decide a substring of  $C$ , as there is no loop. Therefore  $R$  is Turing-Recognizable.

As a decidable language is a subset of a recognizable language, if we can decide on a substring of an input of  $C$ , we can decide the substring.

**Problem 3.**

Let  $C$  be  $x,y$  where  $x$  is anything,  $y$  is empty, and the separator is encoded as the empty string. Then all  $x$  in  $R$  have an  $y$  such that  $x,y$  is in  $C$ .