# Math for Computer Science - In class Problems - Week 3

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## Problem 1

## Problem 2

a.

$$\exists u(uuu = x)$$

Name: THREE-COPIES($x$)

b.

$$\exists u(uu = x \text{ AND NO-1S}(u))$$

Name: EVEN-LENGTH-AND-NO-1S($x$)

c.

$$\text{NOT(SUBSTRING}(1, x)) \text{ OR NOT(SUBSTRING}(0, x))$$

Name: ONLY-0S-OR-ONLY-1S($x$)

d.

$$\exists u(1u1 = x \text{ AND NO-1S}(u))$$

Name: IS-2k+1($x$)

e. Let's assume x contains at least a 1. This way x will not be the prefix of '0x', since each 1 would shifted to the right.

## Problem 3

$$\exists s \forall t_1 \forall t_2 \forall t_3 \left(E(s, t_1) \land E(s, t_2) \implies t_1 = t_2 \lor t_1 = t_3 \lor t_2 = t_3\right)$$

## Problem 4

## Problem 5

a. There are at least three different people, x, y and z which belongs to the cabal.

b. Either Siggi is not a cabal, or Annie is not a cabal, or neither one of them is a cabal.

c. If Elizabeth is a cabal, then everyone is a Cabal. So, Elizabeth can not be a cabal, considering the previous item.

d. If Annie is a cabal then Siggi is a cabal. So Annie is not a Cabal, considering at least one of them is not a cabal.

e. If either Ben or Albert are cabal, then Tom is not a cabal.

f. if eight Ben or Siggi are cabal, then Adam is not a cabal.

g. So, at least three cabal, with the possibilities: Adam, Tom, Albert, Ben, Siggi

h. Suppose Ben is Cabal, then Tom and Adam are not cabal. The group would be: Ben, Albert, Siggi.

i. If Tom is cabal, then Albert and Ben are not. The group would have at most two people, since if Siggi is cabal, then Adam is not.

j. If Adam is cabal, then Siggi and Ben are not. The group would have at most two people, since if Albert is cabal, then Tom is not.

k. The only possible group is Ben, Albert, and Siggi.