

## Week 2: Context Free Grammars

We start with some revision of sets. If you are unfamiliar with any of the notation, please ask one of the TAs.

- \* 1. Write  $\mathbb{N}$  for the set of natural numbers  $0, 1, 2, \dots$ , and write  $\Sigma$  for the alphabet  $\{0, 1\}$ . List the elements of the following sets in any order.

- (a)  $\{1, 2, 3\} \cup \{2, 4, 6\}$
- (b)  $\{1, 2, 3\} \cap \{2, 4, 6\}$
- (c)  $\{1, 2, 3\} \times \{2, 4, 6\}$
- (d)  $\{1, 2, 3\} \setminus \{2, 4, 6\}$
- (e)  $\{2m \mid m \in \mathbb{N}, 0 \leq m \leq 5\}$
- (f)  $\{uu \mid u \in \Sigma^*, |u| = 2\}$
- (g)  $\{u0v \mid u \in \Sigma^*, v \in \Sigma^*, |uv| = 2\}$
- (h)  $\{uvw \mid u \in \Sigma, v \in \Sigma, w \in \Sigma, w \text{ is the xor of } u \text{ and } v\}$

Recall the grammar from the notes for Boolean expressions.

- \* 2. Give derivations for the following strings which are in the language of Boolean expressions.

- (a) `true && false`
- (b) `true || false && true`
- (c) `true && (false || true)`

- \* 3. Give three distinct derivations for the string `true || false`.