

## COSC 382 Chapter 2 Homework

1. Consider G1:

$$\begin{aligned}\text{Expr} &\rightarrow \text{Lex } \{ \text{Lex} \} \\ \text{Lex} &\rightarrow 0 \mid \dots \mid 9 \mid + \mid *\end{aligned}$$

Derive trees for  $5+4*3$  and  $5*4+3$   
Is G1 equivalent to any of 2.6 – 2.9?

2. Consider G2:

$$\begin{aligned}\text{Expr} &\rightarrow \text{Lex } \{ ( \mid + \mid * ) \text{Lex} \} && // \text{ Parens and braces are meta} \\ \text{Lex} &\rightarrow 0 \mid \dots \mid 9\end{aligned}$$

Derive trees for  $5+4*3$  and  $5*4+3$   
Is G2 equivalent to any of 2.6–2.9?

3. Consider the grammars:

G3:

$S \rightarrow \text{NP VP}$

$\text{VP} \rightarrow \text{V NP}$

$\text{NP} \rightarrow \text{cats} \mid \text{dogs} \mid \text{mice} \mid \text{rats}$

$\text{V} \rightarrow \text{chase} \mid \text{eat} \mid \text{bite} \mid \text{befriend}$

G4:

$S \rightarrow \text{NP V NP}$

$\text{NP} \rightarrow \text{cats} \mid \text{dogs} \mid \text{mice} \mid \text{rats}$

$\text{V} \rightarrow \text{chase} \mid \text{eat} \mid \text{bite} \mid \text{befriend}$

Are these grammars equivalent? Why or why not?

4. Consider G5:

$S \rightarrow S \text{ CONJ } S \mid \text{NP VP}$

$\text{VP} \rightarrow \text{VP CONJ VP} \mid \text{V NP}$

$\text{NP} \rightarrow \text{NP CONJ NP} \mid \text{cats} \mid \text{dogs} \mid \text{mice} \mid \text{rats}$

$\text{V} \rightarrow \text{V CONJ V} \mid \text{chase} \mid \text{eat} \mid \text{bite} \mid \text{befriend}$

$\text{CONJ} \rightarrow \text{and} \mid \text{or}$

Derive trees for

- (1) Cats eat mice
- (2) Rats and mice befriend dogs
- (3) Dogs chase and bite cats
- (4) Cats and dogs chase or eat mice and rats
- (5) Cats chase rats and eat mice

5. Consider G6:

$S \rightarrow NP VP$

$VP \rightarrow V NP [PP]$

$NP \rightarrow [D] [AP] N [PP]$

$AP \rightarrow [I] A$

$PP \rightarrow P NP$

$V \rightarrow$  spotted | chased | arrested | eluded

$N \rightarrow$  cops | robber | car | telescope

$D \rightarrow$  the | a

$I \rightarrow$  very | really |

$A \rightarrow$  big | angry | clever |

$P \rightarrow$  with | in |

Derive trees for

- (1) A robber in a car eluded the cops.
- (2) The cops spotted the robber with a telescope.