

Aleksas Muruskas 260718389

Q 2.28 Give unambiguous CFG's for the following languages

b)  $\{w \mid \text{the number of } a\text{'s} = \text{number of } b\text{'s in } w\}$

$G = \{ \{S, AB\}, \{a, b\}, R, S \}$

$S \rightarrow \epsilon \mid bAS \mid aBS$

$R =$   
 $A \rightarrow bAA \mid a$

$B \rightarrow aBB \mid b$

A - another a is needed, B another b is needed  
S is start

c)  $\{w \mid \# \text{ of } a\text{'s} \geq \# \text{ of } b\text{'s}\}$

$G = \{ \{S, AB\}, \{a, b\}, R, S \}$

$S \rightarrow aBS \mid bAS \mid \epsilon$

$R =$   
 $A \rightarrow a \mid bAA$

$B \rightarrow b \mid aBB \mid \epsilon$