Chapter 2 Homework

2.4

2.5 (a,b)

2.6 **Basis**: $\lambda \in b$
Recursive step: If $u \in$ L then $a^{2u}u$, $u(a \cup b)$, *and* $a^{2u}u(a \cup b) \in$ L.
Closure: A string $u \in$ L only if it can be obtained from λ using a finite number of applications of the recursive step.

$(a^2)^*b(a \cup b)^*$

2.7 $\{a^i b^j \mid 0 \leq i \leq j \leq 2i\}$

Basis: $\lambda \in$ L
Recursive step: If $u \in$ L then *aub and aubb* $\in$ L.
Closure: A string $u \in$ L only if it can be obtained from λ using a finite number of applications of the recursive step.

2.8 **Basis**: $\lambda \in$ L
Recursive step:
If $u \in$ L and u can be written $xyzw$ where $x; y; z; w \in \sum^*$ then
$xayazbw \in$ L, $xaybzaw \in$ L, and $xbyazaw \in$ L.
Closure: A string $u \in$ L only if it can be obtained from λ using a finite number of applications of the recursive step.

2.11(a,b)

$\{a^{2i}b^j \mid i \geq 0\}$

2.13 $L_1 \cap L_3 = (a^{12})^*$

2.14 $a^*b^*c^*$

2.15 $a^+b^*c^* \cup a^*b^+c^* \cup a^*b^*c^+$

2.16 $(a \cup b \cup c)^3$

2.17 $(a \cup b \cup c)^0 \cup (a \cup b \cup c)^1 \cup (a \cup b \cup c)^2 \cup (a \cup b \cup c)^3$

2.18 $(a \cup b \cup c)^* - (a \cup b \cup c)^0 \cup (a \cup b \cup c)^1 \cup (a \cup b \cup c)^2 \cup (a \cup b \cup c)^3$

2.19 $(a \cup b)^+ab(a \cup b)^*$

2.20 $aa \cup a^+b^+ \cup bb$

2.21 $(a \cup b)^*aa(a \cup b)^*bb(a \cup b)^* \cup (a \cup b)^*bb(a \cup b)^*aa(a \cup b)^*$

2.23 $a(a \cup c)^*b(a \cup c)^*b(a \cup c)^*cc$