3) $\{ w \in \{a,b\}^* , |w|_a \geq |w|_b \}$

$\exists L$ - регулярный

$\Leftarrow$ из (1) $\Leftarrow a^n b^n = xyz$

$\underbrace{a^n}_{xy} b^n$

т.е. $x = a^l$; $0 \leq l < n$

$y = a^m$, $0 < m \leq n$

$z = a^{n-l-m} b^n$

$\Leftarrow k=0$ $xy^k z = xz = a^l a^{n-l-m} b^n = a^{(n-m)} b^n$ $\Leftarrow h$

$\Rightarrow |w|_a < |w|_b$

противоречие, язык нерегулярный.

4) $\{ w \in \{a,b\}^* , |w|_a \neq |w|_b \}$

$\exists L$ - рег.; аналогично (2) $\Leftarrow a^n b^n = xyz$

$x = a^l$; $0 \leq l < n$

$y = a^m$; $0 < m \leq n$

$z = a^{n-l-m} b^n$

$\Leftarrow k=1$ $\Rightarrow xy^k z = xyz =$

$\Leftarrow a^{2n}$