Key #5

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7) $nor(L_1, L_2) = \{w : w \notin L_1 \text{ and } w \notin L_2\}$

$nor(L_1, L_2) = \bar{L}_1 \cap \bar{L}_2$ eg. $nor(L_1, L_2)$ is all strings

not in L_1 (i.e. $\bar{L}_1$) and not in L_2 (i.e. $\bar{L}_2$)

from the intersection $\cap$

if L_1 and L_2 are regular then $\bar{L}_1$ & $\bar{L}_2$ are regular
(regular languages are closed under complement (Theorem 4.1))

if $\bar{L}_1$ and $\bar{L}_2$ are regular then $\bar{L}_1 \cap \bar{L}_2$ is regular
(reg. Lang. are closed under interseTion (Theorem 4.1))

Thus, $nor(L_1, L_2)$ is closed for reg. languages.

12) Answer in text

13) $L_1 = \{uv : u \in L, |v| = 2\}$ if L is regular show that L_1 is regular

$|v| = 2$ means v is a string of length 2

Consider the language $L_v = \{w : |w| = 2\}$ i.e. all strings of length 2
L_v is finite & thus regular

$L_1 = L L_v$ L & L_v are regular & the regular languages are closed under concatenation so L_1 is regular