Homework Assignment #2
Due: Friday, February 6, 2026 at 7:00 p.m.

[3] **1.** Show that, for all regular expressions R_1, R_2 and R_3,

$$R_1(R_2 \cup R_3) \text{ is equivalent to } R_1R_2 \cup R_1R_3.$$

(Two regular expressions are equivalent if the languages they represent are equal.)

[5] **2.** For any language $L \subseteq \Sigma^*$, let CHANGE1(L) be the set of strings that can be obtained from strings in L by changing exactly one character.
Formally, CHANGE1(L) = $\{xby : x, y \in \Sigma^*, b \in \Sigma$ and $\exists a \in \Sigma$ such that $a \neq b$ and $xay \in L\}$.

For example, if $L = \{\texttt{011}, \varepsilon, \texttt{1}\}$ is a language with alphabet $\Sigma = \{\texttt{0,1}\}$, then CHANGE1($L$) = $\{\texttt{111, 001, 010, 0}\}$.

Prove that if L is regular, then CHANGE1(L) is also regular.