

Exercício 2

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Introduction to the Theory of Computation

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Passo 1

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Part a.

Note that languages $A = \{a^m b^n c^n \mid m, n \geq 0\}$ and $B = \{a^n b^n c^m \mid m, n \geq 0\}$ are context-free, since they are almost the same as context-free language $\{a^n b^n \mid n \geq 0\}$.

Now we see that intersection of languages A and B is language $C = A \cap B = \{a^n b^n c^n \mid n \geq 0\}$. But this language is shown to be non context-free, in *Example 2.36*. Hence intersection of two context-free languages does not need to be context-free.

Part b.

We describe intersection of sets as a complement of union of their complements, using DeMorgan's law: $X \cap Y = \overline{\overline{X} \cup \overline{Y}}$. From here we conclude that class of context-free languages is not closed under complementation. Indeed, if it were closed under complementation, since it is closed under union (as a regular operation), we would get that it is also closed under intersection, which we saw in **part a** not to be the case.

Resultado

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We use language $\{a^n b^n \mid n \geq 0\}$.

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