Automata and Computation Theory | Midterm 2 Practice Problems
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1. Prove that the following language is not regular, where the alphabet $\Sigma = \{0, 1\}$.

$$\{0^m 1^n | m \neq n\}$$

2. Give a formal description (e.g. Set-Builder notation) of the language generated by the following CFG over $\Sigma = \{a, b\}$:

$$S \to AP|PB$$
$$P \to aPb|\epsilon$$
$$A \to aA|a$$
$$B \to bB|b$$

3. Provide a CFG for the following language over $\Sigma = \{0, 1, @\}$:

$$B = \{x_1@y_1@x_2@y_2@...@x_n@y_n | n > 0 \text{ and } x_i^R \text{ is a substring of } y_i, \forall i \in \{1, ..., n\}\}$$

4. Show that the following language over the alphabet $\Sigma = \{a, b, c\}$ is not context free.:

$$A = \{w | w \text{ has an equal number of } a's, b's, \text{ and } c's\}$$