

## Written Homework 1: L<sup>A</sup>T<sub>E</sub>X Tutorial

### GOAL

The goal of this assignment is for you to become acclimated with L<sup>A</sup>T<sub>E</sub>X.

### DETAILS

This assignment is simple (and has nothing to do with algorithms)! All you have to do is to use L<sup>A</sup>T<sub>E</sub>X to recreate the two proofs and one formula below. Please do not spend time analyzing or trying to understand the proofs (I pulled them randomly from the internet) or the formula. Your goal here is to simply create a L<sup>A</sup>T<sub>E</sub>X document that, when generated into a pdf, displays the mathematical notation as seen here. **You MAY NOT setup the formulas in an image and link the image into the document.**

### WHAT WILL I TURN IN?

You will turn in two files:

1. A *written1.tex* file. This is the text file containing your L<sup>A</sup>T<sub>E</sub>X markup.
2. The *written1.pdf* file that is generated running L<sup>A</sup>T<sub>E</sub>X on your written1.tex file.

### THE FORMULAS

Below are the two proofs and the formula you must generate in your document:

1. [4 points]

$$\begin{aligned}
 \frac{n!}{r!(n-r)!} &= \frac{(n-1)!}{r!(n-1-r)!} + \frac{(n-1)!}{(r-1)!((n-1)-(r-1))!} \\
 &= \frac{(n-1)!}{r!(n-1-r)!} + \frac{(n-1)!}{(r-1)!(n-r)!} \\
 &= \dots \\
 &= \frac{(n-r+r)(n-1)!}{r(r-1)!(n-r)(n-r-1)!} \\
 &= \frac{(n)(n-1)!}{r(r-1)!(n-r)(n-r-1)!} \\
 &= \frac{n!}{r!(n-r)!}
 \end{aligned}$$

2. [3 points]

$$\begin{aligned}
 \varphi &= \exists x : \forall y : y \in x \\
 \forall x (x \neq \emptyset \rightarrow \exists y \in x (y \cap x = \emptyset)) \\
 \exists x (x \neq \emptyset \rightarrow \forall y \in x (y \cap x \neq \emptyset)) \\
 &\quad \exists y \in x (y \cap x \neq \emptyset) \\
 \{y \cap x = \emptyset, y \cap x \neq \emptyset\} &\vdash \phi
 \end{aligned}$$

3. [3 points]

$$T(n) = \left[ T\left(\frac{n}{2^i}\right) + \sum_{k=0}^{i-1} \left(\log_2 \frac{n}{2^k}\right) \right] + 1$$

### RESOURCES

Here are some resources. Remember that, as always, Google is your friend.

1. [Tutorial](#): A nice extensive tutorial of  $\text{\LaTeX}$ .
2. [Example](#): A good example of a very simple  $\text{\LaTeX}$  document to get you started.
3. [Symbols](#): A nice extensive list of the symbols  $\text{\LaTeX}$  can create.
4. [More Symbols](#): More symbols, including set theory symbols.