LaTeX Workshop Exercise Sheet

December 2022

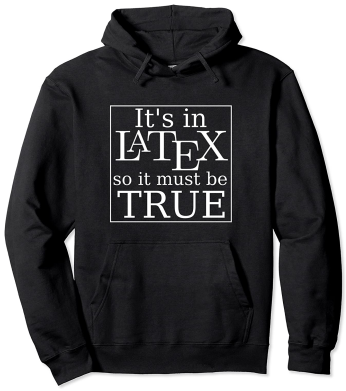
Exercise 1: Reproduce the following: A **number** is a mathematical object used to count, measure, *and* label. The original examples are the natural numbers 1, 2, 3, 4, and so forth. Other categories of numbers include:

- Rational numbers: $\frac{1}{2}$
- Transcendental numbers: π
- Irrational numbers: $\sqrt{2}$, $\sqrt[3]{2}$
- Real numbers: 1
- Complex numbers: $a + bi$

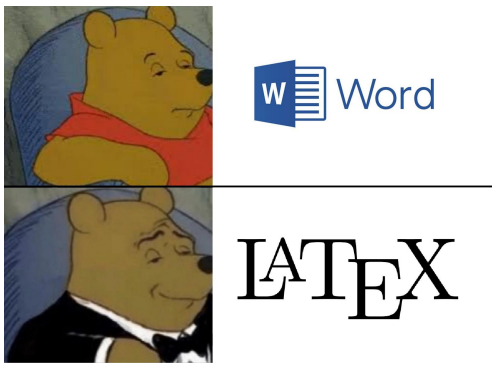
Exercise 2: Reproduce the following:

$$(\forall \varepsilon > 0)\,(\exists \delta > 0)\,(\forall x \in \mathbb{R})\,(0 < |x - p| < \delta \implies |f(x) - L| < \varepsilon)$$

Exercise 3: Reproduce the following (the images can be found here and here):



(a) A trivial statement



(b) A funny meme

Figure 1: Truer words have never been spoken.

×	**1**	**i**	**j**	**k**
1	1	i	j	k
i	i	-1	-k	-j
j	j	-k	-1	i
k	k	j	-i	-1

Table 1: Quaterinon multiplication table

Exercise 4: Math expression

$$\exists n \geq 3, x, y, z \in \mathbb{N} \mid x^n + y^n = z^n \tag{1}$$

This result follows naturally from the argument in Figure **??**, and we leave it as an exercise to the reader.✓

Exercise 5: Matrices and Tables

$$\begin{bmatrix} \cos(\theta) & -\sin(\theta) \\ -\sin(\theta) & \cos(\theta) \end{bmatrix}$$

$$\begin{pmatrix} k \\ 1 \\ 1 \end{pmatrix} = \alpha \times \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix} + \beta \times \begin{pmatrix} 0 \\ 0 \\ k \end{pmatrix}$$

Exercise 6: Prove that if n^2 is even, then n is even.

Challenge: Let A be the set of solvable problems in polynomial time by a deterministic Turing machine and B the set of solvable problems in polynomial time by a non-deterministic Turing machine. Is $A = B$?
Reward: €100