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Technical English

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Lesson N°3 : Improve writing skill

Common Mistakes in Technical English for Mathematicians

Objective: Our objective is to identify and correct frequent errors in mathematical writing in English, enhancing clarity and precision in scientific communication.

1. Starting sentences with symbols

- **Mistake:** Beginning a sentence with a mathematical symbol or expression.
 - *Example:* " $2\sqrt{2}$ is irrational."
- **Correction:** Initiate the sentence with words.
 - *Example:* "The number $2\sqrt{2}$ is irrational."

2. Subject-Verb Agreement

- **Mistake:** Incorrect agreement between the subject and verb, especially with intervening information.
 - *Example:* "The set of solutions are finite."
- **Correction:** Ensure the verb agrees with the main subject.
 - *Example:* "The set of solutions is finite."

3. Incorrect Use of "et al."

- **Mistake:** Improper punctuation of "et al."
 - *Example:* "Smith et. al" or "Smith et al"

The expression "**et al.**" is an abbreviation of the Latin phrase "*et alii*", which means "**and others**". It is commonly used in scientific writing to refer to multiple authors in a citation or a bibliographic reference.

Examples of Usage:

1. **In an in-text citation:**

- *According to Smith et al. (2020), the results confirm the hypothesis.*

2. **In a bibliography:**

- Smith, J., Johnson, R., & Doe, A. (2020). *Mathematical Modeling of Heat Transfer*. Springer.

This can be abbreviated as **Smith et al. (2020)** when cited in the text.

Why Use "et al."?

- **To avoid listing all authors** when there are many (usually three or more).
- **To make the text more concise** and avoid clutter. (clutter = désordre)

⚠ **Important:** "et al." is an abbreviation, so there must always be a **period** after "al" but **never** after "et". The correct form is "**et al.**", not "**et. al.**" or "**et.al**".

- **Correction:**

- *Example:* "Smith et al."

4. **Confusion Between "e.g." and "i.e."**

- **Mistake:** Using "e.g." and "i.e." interchangeably.
- *Example:* "We study prime numbers, i.e., 2, 3, 5, etc."

i.e.= "id est"= « that is » or « which means »= c'est-à-dire, qui veut dire, ...

e.g.= "exempli gratia"= for example=par exemple (ex.) (il est toujours suivi d'une virgule en anglais (e.g.,)).

- **Correction:** Use "e.g." for "for example" and "i.e." for "that is."
- *Example:* "We study prime numbers, e.g., 2, 3, 5, etc."

5. **Using "not" Instead of "non-"**

- **Mistake:** Using "not" to form negative adjectives.

- *Example:* "A not empty set."
- **Correction:** Use the prefix "non-" without a space or hyphen.
- *Example :* "A nonempty set."

NON- vs NOT

When negating a concept in English, you have two options:

- Using "**not**" in a negative sentence.
- Using a prefix in a single word.

1. "Not" is used to negate **a verb, an adjective, or an adverb**. When we use "not", we get a **negative sentence**.

Examples:

- **This is not correct.**
- **The number is not even.**
- **x is not a prime number.**
- **The function is not differentiable at $x = 0$.**
- **This equation does not have a real solution.**

2. "Non-" is a prefix meaning "not". It is used in **some adjectives or nouns** to form the **opposite**. When we use "non-", we get a **positive sentence**.

Examples:

- **Nonzero number** → A number that is **not** equal to zero.
- **Nonnegative number** → A number that is **not** negative, (i.e. it is ≥ 0).
- **Nonlinear equation** → An equation that is **not** linear.
- **Non-Euclidean geometry** → A type of geometry that does **not** follow Euclidean axioms.

Note: non- is not the only prefix used to form the opposite of a noun or an adjective, here are some examples:

Logical → **Il**logical
 Fair → **Un**fair
 Possible → **Im**possible
 Satisfied → **Un**satisfied or **Diss**satisfied
 Regular → **Ir**regular

3. Understanding the Difference Between "Not" and "Non-" (in Mathematics)

Most of the time, both forms are possible,

Example:

The set is **not empty**, meaning it contains at least one element. (Correct)

The set is **nonempty**, meaning it contains at least one element. (Correct)

- But in a lot of cases, "**non-**" **makes the sentence smoother and more natural**, because it keeps the sentence **positive** and avoids unnecessary negation.

Examples

✓ *We study **nonlinear** differential equations.*

✓ *We study differential equations that are **not linear**.* (Correct, but less natural)

✓ *We study **nonsingular** matrices in linear algebra.*

✓ *We study matrices that are **not singular** in linear algebra.* (Correct, but less common)

✓ *The equation has a **nontrivial** solution.*

✓ *The equation has a solution that is **not trivial**.* (Correct but wordy= **Correct mais alourdi**).

- We may also use non- when the sentence begins by "a" or "the", for example:

A **nonsingular** matrix is invertible. (instead of : A matrix that is not singular is invertible).

4. Some other adjectives and nouns that take non- in their opposites (in mathematics)

- **Nonzero number**
- **Nonnegative number**
- **Nonpositive number**
- **Noninteger**
- **Nonreal number**
- **Nonempty set**

- **Nonsingular matrix**
- **Nonlinear function/equation**
- **Nonhomogeneous equation**
- **Nonconstant function**
- **Non-Euclidean geometry**
- **Nonsymmetric matrix**
- **Nonconvex shape/set**
- **Nontrivial solution**
- **Noncommutative algebra**
- **Nonmeasurable set**
- **Nonreflexive relation**

5. Hyphenation rules

- "Non-" is **not hyphenated** in most cases: **nonempty, nonnegative**.
- Use a hyphen only when the word **begins with a capital letter**:
 - ✓ *A non-English speaker.*
 - ✓ *A non-Euclidean space.*

6. Quick Exercise: Choose between "not" and "non-"

- The**zero** matrix has at least one nonzero element.
- A**trivial** solution is the one we are looking for.
- The**degenerate** conic section is either an ellipse or a hyperbola.
- A**decreasing** sequence can still have a limit.
- The equation is **solvable** using elementary methods.
- The limit is **defined** because the left and right limits are different.
- The series is **absolutely** convergent, but it is conditionally convergent.

Answers

- The **nonzero** matrix has at least one nonzero element.
Instead of : The matrix that is not equal to zero has at least one element that is not equal to zero ! (**Wrong formulation**).
- A **nontrivial** solution is the one we are looking for.
- The **nondegenerate** conic section is either an ellipse or a hyperbola.
- A **nondecreasing** sequence can still have a limit.
- The equation is **not solvable** using elementary methods. (**not solvable=unsolvable**)
- The limit is **not defined** because the left and right limits are different. (**not defined=undefined**).

- The series is **not absolutely** convergent, but it is conditionally convergent. (**no opposite to absolutely, the negative form is necessary**).

6. Addition : Correct Usage of "etc."

- "etc." stands for "et cetera" (Latin for "and so on" or "and other similar things").
- It is **always followed by a period** because it is an abbreviation.
- It is used for **lists of similar items**, not to complete sentences!

◇ Example:

- *We need fruits like apples, oranges, bananas, etc.* ✓
- *She bought pens, pencils, notebooks, etc.* ✓

✗ Mistakes to Avoid

1. Don't use "and" before "etc."

- ✗ *We need apples, oranges, and etc.* (Incorrect)
- ✓ *We need apples, oranges, etc.* (Correct)

2. Don't use "etc." with people (Use "and others" instead)

- ✗ *Newton, Einstein, Gauss, etc. were great scientists.* (Incorrect)
- ✓ *Newton, Einstein, Gauss, and others were great scientists.* (Correct)

3. Avoid using "e.g." and "etc." together

- *e.g.* means "**for example**", so adding "etc." is redundant.
- ✗ *We need supplies, e.g., paper, ink, etc.* (Incorrect)
- ✓ *We need supplies, e.g., paper, ink.* (Correct)

or :

- ✓ *We need supplies, paper, ink, etc.* (Correct)

TD N°3 : Identifying and Correcting Errors

Exercise 1

Each of the following sentences contains one or more errors commonly found in mathematical writing. Identify the mistake(s) and provide the corrected version.

1. "Let $x \in \mathbb{R}$, then $x^2 \geq 0$."
2. "The function $f(x)$ is continuous, e.g., it has no breaks."
3. "Consider the set $A = \{1, 2, 3, \dots\}$ which is infinite."
4. "Each student must submit their assignment by Friday."
5. "The equation has two solution's."

Exercise 2

For each sentence below, identify the mistake(s) and provide the corrected version.

1. "Let n be an integer. n is even if it is divisible by 2."
2. "The function $f(x)$ achieve its maximum at $x=2$."
3. "According to Smith et al the theorem is proven."
4. "We consider several factors, i.e., temperature, pressure, and volume."
5. "A not-zero vector is linearly independent."

TD N°3 solution: Identifying and Correcting Errors

Exercise 1 : Each of the following sentences contains one or more errors commonly found in mathematical writing. Identify the mistake(s) and provide the corrected version.

Solutions:

1. "Let $x \in R$, then $x^2 \geq 0$."

Mistake: Comma splice (using a comma to join two independent clauses).

- **Correction:** "Let $x \in R$. Then $x^2 \geq 0$."
- **Explanation:** In mathematical writing, it's important to separate independent clauses properly. A period or a semicolon should be used instead of a comma to avoid a comma splice.

2. "The function $f(x)$ is continuous, e.g., it has no breaks."

Mistake: Misuse of "e.g." instead of "i.e."

- **Correction:** "The function f , ($f(\cdot)$ or $x \mapsto f(x)$) is continuous; i.e., it has no breaks."
- **Explanation:** "i.e." means "that is," while "e.g." means "for example." In this context, "i.e." is appropriate.

3. "Consider the set $A = \{1,2,3,\dots\}$ which is infinite."

Mistake: Missing comma after the closing brace of the set.

- **Correction:** "Consider the set $A = \{1, 2, 3, \dots\}$, which is infinite."
- **Explanation:** A comma should follow the closing brace to separate the descriptive clause.

4. "Each student must submit their assignment by Friday."

Mistake: Using "their" as a singular pronoun.

- **Correction:** "Each student must submit his assignment by Friday."
 - **Explanation:** "his or her" is used to refer to a singular antecedent.
5. "The equation has two solution's."

Mistake: Incorrect use of an apostrophe in a plural noun.

- **Correction:** "The equation has two solutions."
- **Explanation:** Apostrophes should not be used to form plurals; they indicate possession.

Exercise 2 For each sentence below, identify the mistake(s) and provide the corrected version.

Solutions:

1. "Let n be an integer. n is even if it is divisible by 2."

Mistake: Starting a sentence with a symbol.

- **Correction:** "Let n be an integer. **Thus**, n is even if it is divisible by 2."

2. "The function $f(x)$ achieve its maximum at $x=2$."

Mistake: Subject-verb disagreement ("achieve" should be "achieves").

- **Correction:** "The function f , ($f(\cdot)$ or $x \mapsto f(x)$) **achieves** its maximum at $x=2$."

3. "According to Smith et al the theorem is proven."

Mistake: Incorrect punctuation of "et al."

- **Correction:** "According to Smith **et al.**, the theorem is proven."

4. "We consider several factors, i.e., temperature, pressure, and volume."

Mistake: Misuse of "i.e." instead of "e.g."

- **Correction:** "We consider several factors, **e.g.**, temperature, pressure, and volume."

5. "A not-zero vector is linearly independent."

Mistake: Using "not" instead of "non-."

- **Correction:** "A **nonzero** vector is linearly independent."