

Tips and common corrections

[1] Some comments about notation.

- (a) The symbol “ = ” means *equals*, and nothing else. Points are lost on tests and quizzes for using it inappropriately.
- (b) The symbol “ \Rightarrow ” means *implies*. It connects sentences or logical statements; it does not connect values or expressions. For instance:

$$\sin^2 x + \cos^2 x = 1 \Rightarrow 2\cos^2 x + 3\sin^2 x = 2 + \sin^2 x.$$

The symbol “ \rightarrow ” means *tends to*, as in “has limit”, or *maps to*, as in $f : R \times R \rightarrow R$. It cannot be substituted to “ \Rightarrow ”.

- (c) The symbol “ \in ” means *belongs to*. It relates elements to sets. The symbol “ \subset ” means *is included in*. It allows to compare between sets. The two symbols are not interchangeable.
- (d) Use of parentheses.

To multiply x by $-y$, we write $x(-y)$. “ $x \cdot -y$ ” or “ $x \times -y$ ” is incorrect, even if you reduce the size of the minus sign, raise it and stick it very close to y .

Also, $x - y$ and $x + (-y)$ are correct. “ $x + -y$ ” is not, even if you reduce the size of the minus sign, raise it and stick it very close to y .

- (e) The notations $\frac{dz}{dx}$, $\frac{\partial z}{\partial x}$ mean different things. The first is a total derivative (z is a function of x only, possibly through intermediate variables), whereas the second is a partial derivative.

[2] “ $\sqrt{x^2} = x$ ” is wrong, since x may be negative. The correct formula is $\sqrt{x^2} = |x|$, which is more complete than “ $\sqrt{x^2} = \pm x$ ”. For the same reason, $y^{2/3} = x$ is equivalent to $y^2 = x^3$, (where y may be negative), but not to $y = x^{3/2}$, where y is never negative.

[3] Distinguish between series and finite sums.

$$\sum_0^{\infty} z^n = 1 + z + z^2$$

is incorrect.

$$\sum_0^{\infty} z^n = 1 + z + z^2 + \dots + z^n$$

is also incorrect: even if you stop at n instead of ∞ , the right-hand side has only finitely many terms.

$$\sum_0^{\infty} z^n = 1 + z + z^2 + \dots$$

and

$$\sum_0^{\infty} z^n = 1 + z + \dots + z^n + \dots$$

are both correct. The use of the three dots at the end is important.