

## Writing Mathematical Expressions in Plain Text – Examples and Cautions

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Mathematical expressions can be typed online in a number of ways including plain text, ASCII codes, HTML tags, or using an equation editor (see [Writing Mathematical Notation Online](#) for overview). The most common way is to write expressions horizontally in plain text, but you have to format the expressions carefully using appropriately placed parentheses and accurate notation. This document provides examples and important cautions for writing mathematical expressions in plain text.

### Section 1. How to Write Exponents

Just as on a graphing calculator, when writing in plain text the caret key ^ (above the 6 on a qwerty keyboard) means that a power follows. For example  $x^2$  would be written as x^2.

Example 1a.

$4x^2y^3$  would be written as 4 x^2 y^3 or for added clarity with the multiplication mark as 4\*x^2\*y^3.

Example 1b.

With more than one item in the exponent you must enclose the entire exponent in parentheses to indicate exactly what is in the power.

$x^{2n}$  must be written as x^(2n) and NOT as x^2n. Writing x^2n means  $x^2n$ .

Example 1c.

When using the quotient rule of exponents you often have to perform subtraction within an exponent. In such cases you must enclose the entire exponent in parentheses to indicate exactly what is in the power.

The middle step of  $\frac{x^5}{x^2} = x^{5-2} = x^3$  must be written as x^(5-2) and NOT as x^5-2 which means  $x^5 - 2$ .

Example 1d.

You must enclose fractional exponents in parentheses to indicate that the entire fraction is in the power.

$x^{\frac{2}{3}}$  must be written as x^(2/3) and NOT as x^2/3. Writing x^2/3 means  $\frac{x^2}{3}$ .

### Section 2. How to Write Repeating Decimals

There is no over-strike bar on your keyboard, so the only way to write a repeating decimal in plain text is to write several repetitions of the repeating numbers followed by an ellipsis (dot dot dot).

Example 2.  $1.\overline{23}$  would be written as 1.2323232323...

### **Section 3. How to Write Absolute Value Bars**

On the right of your keyboard, usually above the backslash, is a mark that looks like a vertical dash above another vertical dash. It produces a single vertical bar  $|$ . Use it to produce absolute value bars.

Example 3.  $2 - |x - 3|$  could be written as  $2 - |x - 3|$ .

### **Section 4. How to Write Inequalities**

The less than and greater than keys are on your keyboard. To type “less than or equal to” or “greater than or equal to” type the original inequality, select it, and underline it to produce  $\leq$  or  $\geq$ . Alternatively use an [ASCII code](#) to produce these symbols (ALT+243 and ALT+242). On a MAC computer hold down ALT while typing the original inequality and it will automatically create  $\leq$  or  $\geq$ .

Example 4. 30 is less than or equal to x could be written as  $30 \leq x$ .

### **Section 5. How to Write Fractions**

When writing rational expressions (fractions) horizontally USE PARENTHESES. When the numerator contains more than one item, you MUST have parentheses around the entire numerator. When the denominator contains more than one item, you MUST have parentheses around the entire denominator.

Example 5a.

$\frac{2x}{x-3}$  would be written horizontally as  $(2x)/(x-3)$ .

Parentheses must enclose the entire numerator and parentheses must enclose the entire denominator to indicate that the entire  $2x$  is divided by the entire  $x-3$ . I can't stress enough how important this is!

If you neglect the parentheses and write  $2x/x-3$  then, by order of operations, this means  $\frac{2x}{x} - 3$ , a completely different expression.

Example 5b.

$\frac{3}{x-2}$  must be written as  $3/(x-2)$  and NOT as  $3/x+2$ . Writing  $3/x+2$  means  $\frac{3}{x} + 2$ .

Example 5c.

$\frac{x+3}{2}$  must be written as  $(x+3)/2$  and NOT as  $x+3/2$ . Writing  $x+3/2$  means  $x + \frac{3}{2}$ .

Example 5d.

$\frac{(x-1)(x-2)}{(x-3)(x-4)}$  must be written as  $[(x-1)(x-2)] / [(x-3)(x-4)]$  and NOT as  $(x-1)(x-2)/(x-3)(x-4)$ .

Note the extra set of grouping symbols (I like to use square brackets) around the entire numerator and around the entire denominator. Believe it or not, by order of operations, writing  $(x-1)(x-2)/(x-3)(x-4)$  means  $\frac{(x-1)(x-2)(x-4)}{(x-3)}$ , ugh! See how messed up things can get if you neglect to include the parentheses to clearly indicate what expression is in the numerator and what expression is in the denominator?

Example 5e.

This common “neglected parentheses” notation error only occurs when you are typing the problem *horizontally*. Instead you could write the fraction vertically. For example, instead of writing  $\frac{2x}{x-3}$  horizontally as  $(2x)/(x-3)$  you could write the fraction vertically (see below) and then you don't need the parentheses because it is clear exactly what is being divided by what.

$$\frac{2x}{x-3}$$

To produce this fraction type the numerator, type the denominator in the next line down (use SHIFT+ENTER), highlight the numerator, and click the underline key U to form the fraction bar. Voila!

## Section 6. How to Write Radicals

You can use “sqrt” for square root, “cubert” or “3RT” for cube root, “fourthrt” or “4RT” for fourth root, etc. No matter what the index of the radical is, be sure to enclose the entire radicand in parentheses to indicate exactly what is in the radical.

Example 6a.

$\sqrt{x+3}$  would be written as sqrt(x+3).

Don't forget the parentheses! Do NOT write sqrt x+3 as this means  $\sqrt{x} + 3$ , a very different expression. The same caution holds if you use [ASCII codes](#) to create the radical symbol (ALT+251 will create v).

You must write v(x+3) not vx+3. Writing v(x+3) means the square root of the entire x+3, i.e.  $\sqrt{x+3}$ , but vx+3 means only the x is under the radical, i.e.  $\sqrt{x} + 3$ . Similarly v5x means  $\sqrt{5x}$  with only the 5 under the radical, but if you want  $\sqrt{5x}$  you must instead write v(5x).

Example 6b.

$\sqrt[3]{x^2}$  could be written as cubert(x^2) or as 3RT(x^2) or using fractional exponents as  $x^{(2/3)}$ .

Do NOT write as 3sqrt(x^2) nor as 3vx^2 as these both mean “3 times a square root” not “cube root”. The  $\sqrt{\quad}$  symbol can only be used for square roots, not higher roots.

Example 6c.

$\sqrt[3]{2x-1}$  could be written as cubert(2x-1) or as 3RT(2x-1) or using fractional exponents as  $(2x-1)^{1/3}$ .

Example 6d.

$\sqrt[4]{\frac{x}{5}}$  could be written as fourthrt(x/5) or as 4RT(x/5) or as  $(x/5)^{1/4}$ .

Example 6e.

$2x\sqrt[5]{y}$  could be written as 2x\*fifthrt(y) or as 2x\*5RT(y) or as  $2xy^{1/5}$ .

Example 6f.

The quadratic formula  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$  could be written as  $x = [-b +/- \text{sqrt}(b^2 - 4ac)] / [2a]$

I know it's ugly, but accurate! Using [ASCII codes](#) you could clean it up a bit:  $x = [-b \pm \sqrt{b^2 - 4ac}] / [2a]$ .

## **Section 7. How to Write Logarithms**

Natural and common logarithms can easily be typed as is. It is only logarithms with a specific base displayed that require special formatting. No matter what type of logarithmic function, be sure to enclose the entire argument in parentheses to indicate exactly what is in the logarithm.

Example 7.  $\log_3(x-2)$  could be typed initially as LOG3(x-2), then select the 3 and click the subscript key in the discussion board message menu (the icon looks like  $x_2$ ) to create  $\text{LOG}_3(x-2)$ . Using capital letters for the logarithm isn't necessary but does intensify the smallness of the base.

## **Section 8. How to Write Trigonometric Expressions**

Example 8a.

Some Greek letters can be typed using [ASCII codes](#) (or HTML tags if you are familiar with HTML programming). Otherwise, I recommend that you use acceptable alternatives. For instance,  $\cos \theta$  can be written as cos(theta), cos(t), or cosT.  $\sin(2\alpha)$  can be written as sin(2 alpha), sin(2a), or sin2A.

Example 8b.

$2\cos \theta \sin \theta$  could be written as 2cos(t)sin(t) or as 2cosTsinT.

Example 8c.

$\frac{\sin \theta}{\cos \theta}$  could be written as sin(t)/cos(t) or as sinT/cosT.

Example 8d.

$\sin^2 \theta$  could be written as  $(\sin(t))^2$  or as  $(\sin T)^2$ .

Do NOT write  $\sin T^2$  which means  $\sin T^2$ , nor  $\sin^2 T$  which looks like the nonsensical  $\sin^{2T}$ .

Example 8e.

$\cos^{-1} x$  is best written as  $\arccos(x)$ .

Example 8f.

Common trig symbols include the angle symbol and the degree mark. For the angle symbol personally I use HTML tags, but in plain text you can just use words such as writing  $\angle B$  as "angle B".

To produce the degree mark (which is vitally important to include on every angle that is in degrees so as to not confuse it with radians) using an [ASCII code](#) is an easy way (ALT+0176 will create  $^\circ$ ). Or you can click the superscript key in the discussion board message menu (the icon looks like  $x^2$ ) then put a little oh for the power. Or you can just use words such as writing  $30^\circ$  as "30 degs".

## **Section 9. How to Write Calculus (Limits, Derivatives, and Integrals)**

Using an equation editor to type calculus expressions online is preferred, but occasionally a quick plain text message is appropriate so here are examples of typing limits, derivatives, and integrals.

Example 9a.

$\lim_{x \rightarrow 0} \frac{\sin x}{x}$  can be written in words as "the limit of  $(\sin x)/x$  as  $x \rightarrow 0$ "

or by writing "lim  $x \rightarrow 0$   $(\sin x)/x$ " preferably with  $x \rightarrow 0$  as a subscript so it looks like " $\lim_{x \rightarrow 0} (\sin x)/x$ ".

Example 9b.

$\frac{d}{dx} (\ln x^2)$  can be written as  $d/dx (\ln x^2)$ .

Example 9c.

If evaluating the derivative at a specific value such as  $\left. \frac{d}{dx} (\ln x^2) \right|_1^e$  you can use the horizontal "evaluate at" bar which is, on a standard keyboard, on the right side above the  $\backslash$  symbol and looks like two vertical lines but types as  $|$ . So this expression could be written as " $d/dx (\ln x^2) |_{x=1} \text{ to } x=e$ " or use more words such as " $d/dx (\ln x^2)$  evaluated from  $x=1$  to  $x=e$ ".

Example 9d.

$\int e^x \sin x dx$  can be written using INT for "the integral of" as " $\text{INT}(e^x * \sin(x)) dx$ ". Note that the integral symbol can be typed using HTML tags if you are familiar with HTML programming.

Example 9e.

If evaluating a definite integral, more words must be used or again the horizontal “evaluate at” bar. For instance  $\int_1^{\pi} e^x \sin x dx$  could be written as “INT( $e^x*\sin(x)$ )dx|x=1 to x=pi” or “INT( $e^x*\sin(x)$ )dx evaluated from x=1 to x=pi”.

Example 9f.

$\sum_{k=5}^{\infty} \frac{1}{k-2}$  can be written as “SUM( $1/(k-2)$ )|k=5 to k=infinity” or “SUM( $1/(k-2)$ ) from k=5 to k=infinity”.

Note that the summation sign and the infinity sign can be written using [ASCII codes](#) or HTML if you prefer.