

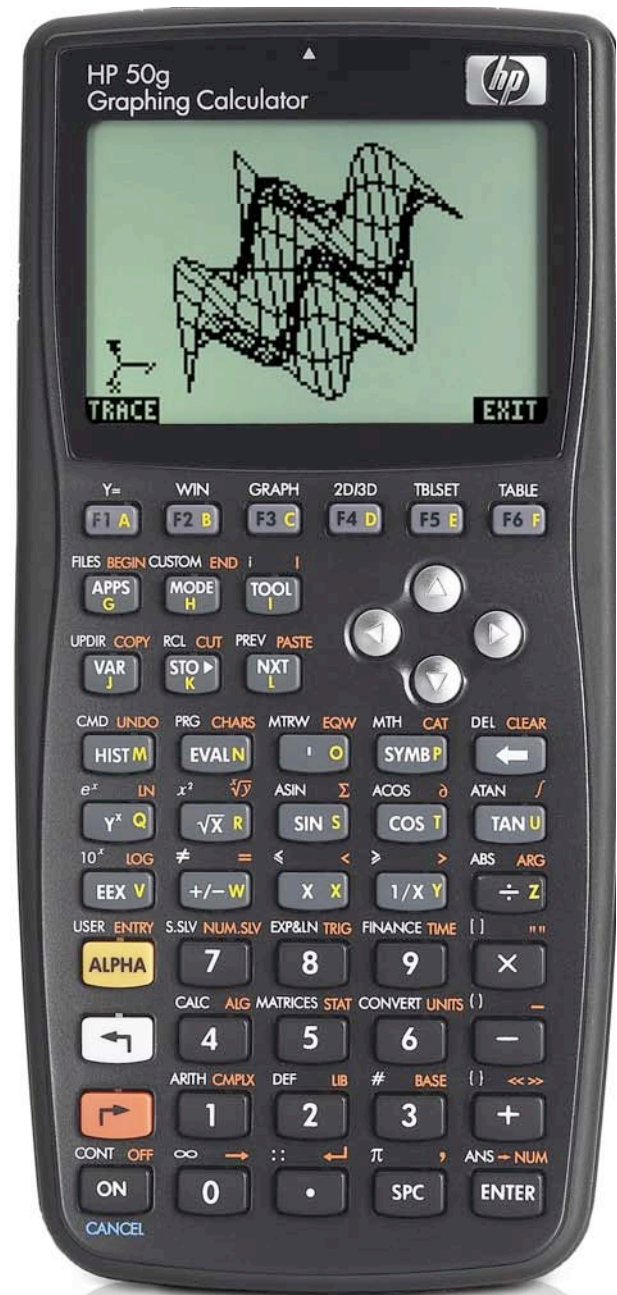


hp calculators

HP 50g Using the EquationWriter

The EquationWriter

Practice using the EquationWriter to solve problems



The EquationWriter

The EquationWriter is one of the most useful tools built into the HP 50g calculator. With it, you can work through complicated calculations and see the equation take shape before your eyes. Since the EquationWriter displays the evolving calculation in a textbook format, it is possible to easily compare the display to an equation on paper and ensure proper entry. The EquationWriter is the ORANGE shifted function of the $\boxed{\text{EQW}}$ key and is started by pressing $\boxed{\text{EQW}}$. The display will now look like this:

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RAD XYZ HEX R= 'X'
{HOME}
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EDIT CURS BIG EVAL FACTO SIMP
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Figure 1

The menu choice **BIG** above the $\boxed{\text{F3}}$ key allows the equation being entered to be seen in a big font (indicated by the small square in the menu label) or a smaller font (indicated by the lack of a square in the menu label).

The $\boxed{\leftarrow}$ $\boxed{\nabla}$ $\boxed{\blacktriangle}$ $\boxed{\rightarrow}$ arrow keys allow movement around the EquationWriter screen to make changes to different areas of the expression being entered. Some of these uses are illustrated by the example problems below.

Practice using the EquationWriter to solve problems

Example 1: In an electrical circuit, four resistors are connected in parallel. Their values are 220 ohms, 560 ohms, 1.2 kilohms, and 5 kilohms. What is the total resistance of the circuit?

Solution: The total resistance is found using this formula:

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$$\frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}}$$

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Figure 2

where R1 is the resistance of resistor 1, etc. Use the EquationWriter to find the total resistance.

$\boxed{\text{EQW}}$ $\boxed{1}$ $\boxed{\div}$ $\boxed{1}$ $\boxed{\div}$ $\boxed{2}$ $\boxed{2}$ $\boxed{0}$ $\boxed{\rightarrow}$ $\boxed{+}$ $\boxed{1}$ $\boxed{\div}$ $\boxed{5}$ $\boxed{6}$ $\boxed{0}$ $\boxed{\rightarrow}$
 $\boxed{+}$ $\boxed{1}$ $\boxed{\div}$ $\boxed{1}$ $\boxed{2}$ $\boxed{0}$ $\boxed{0}$ $\boxed{\rightarrow}$ $\boxed{+}$ $\boxed{1}$ $\boxed{\div}$ $\boxed{5}$ $\boxed{0}$ $\boxed{0}$ $\boxed{0}$ $\boxed{\rightarrow}$

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$$\frac{1}{\frac{1}{220} + \frac{1}{560} + \frac{1}{1200} + \frac{1}{5000}}$$

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EDIT CURS BIG EVAL FACTO SIMP
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Figure 3

$\boxed{\text{ENTER}}$

Figure 4

To convert this to a number, press \rightarrow \rightarrow NUM.

Answer: 135.7865 ohms.

Example 2: The 1906 San Francisco earthquake, with a magnitude of 8.25 on the Richter Scale, is estimated to be 105 times greater than the Nicaragua quake of 1972. What would be the Richter Scale reading of this 1972 earthquake?

Solution: The equation relating the two earthquakes is:

Figure 5

where R1 would be the Richter scale reading of the 1972 Nicaraguan earthquake, R2 is the Richter Scale reading of the 1906 San Francisco earthquake, M2 is the magnitude of the 1906 earthquake and M1 is the magnitude of the 1972 earthquake. Since the 1906 earthquake was estimated to be 105 times greater than the 1972 earthquake, M2 will be 105 and M1 will be 1. Use the EquationWriter to find the answer.

\rightarrow EQW 8 . 2 5 - \rightarrow LOG 1 0 5 \div 1

Figure 6

ENTER \rightarrow \rightarrow NUM.

Figure 7

Answer: The 1972 earthquake's Richter Scale reading was approximately 6.23.

Example 3: What is the sum of $X/2 + 2/X$ from $X = 1$ to 100?

HP 50g Using the EquationWriter

Solution: Use the EquationWriter to find the answer. Use the \sum function. Note that the \boxed{x} key below is the X key, not the multiply key.

$\boxed{\rightarrow}$ \boxed{EQW} $\boxed{\rightarrow}$ $\boxed{\Sigma}$ \boxed{x} $\boxed{\rightarrow}$ $\boxed{1}$ $\boxed{\rightarrow}$ $\boxed{1}$ $\boxed{0}$ $\boxed{0}$ $\boxed{\rightarrow}$ \boxed{x} $\boxed{\div}$ $\boxed{2}$ $\boxed{\rightarrow}$ $\boxed{+}$ $\boxed{2}$ $\boxed{\div}$ \boxed{x}

RAD XYZ HEX R= 'X'
{HOME}

$$\sum_{x=1}^{100} \frac{x}{2+x}$$

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Figure 8

\boxed{ENTER} $\boxed{\rightarrow}$ $\boxed{\rightarrow NUM}$.

RAD XYZ HEX R= 'X'
{HOME}

7:
6:
5:
4:
3:
2:
1: 2,535.3748

EDIT VIEW RCL STOP PURGE CLEAR

Figure 9

Answer: The answer is 2,535.3748.

Example 4: The position of a projectile at time t after it was fired with an initial altitude h , initial velocity v_0 feet/second, and initial trajectory angle A from the horizontal axis is given by the equations:

$$X = v_0 t \cos(A)$$

and

$$Y = h + v_0 t \sin(A) - \frac{1}{2} g t^2$$

where g is a constant 32 feet/second².

An object is thrown with an initial velocity of 34 feet/second. If the initial angle of the trajectory is 43 degrees and the object is released at a height of 5 feet above the ground, where is the object located after 1.25 seconds?

Solution: Use the EquationWriter to find the answer. Make sure the calculator is in degrees mode.

\boxed{MODE} $\boxed{\nabla}$ $\boxed{\nabla}$ $\boxed{\text{DEG}}$

RAD XYZ HEX R= 'X'
{HOME}

CALCULATOR MODES

Operating Mode: RPN

Num: Degrees .FM,

Ang: Radians

Coord: Grads

✓ Be: $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{5}$ $\frac{1}{6}$ $\frac{1}{7}$ $\frac{1}{8}$ $\frac{1}{9}$ $\frac{1}{10}$ $\frac{1}{11}$ $\frac{1}{12}$ $\frac{1}{13}$ $\frac{1}{14}$ $\frac{1}{15}$ $\frac{1}{16}$ $\frac{1}{17}$ $\frac{1}{18}$ $\frac{1}{19}$ $\frac{1}{20}$ $\frac{1}{21}$ $\frac{1}{22}$ $\frac{1}{23}$ $\frac{1}{24}$ $\frac{1}{25}$ $\frac{1}{26}$ $\frac{1}{27}$ $\frac{1}{28}$ $\frac{1}{29}$ $\frac{1}{30}$ $\frac{1}{31}$ $\frac{1}{32}$ $\frac{1}{33}$ $\frac{1}{34}$ $\frac{1}{35}$ $\frac{1}{36}$ $\frac{1}{37}$ $\frac{1}{38}$ $\frac{1}{39}$ $\frac{1}{40}$ $\frac{1}{41}$ $\frac{1}{42}$ $\frac{1}{43}$ $\frac{1}{44}$ $\frac{1}{45}$ $\frac{1}{46}$ $\frac{1}{47}$ $\frac{1}{48}$ $\frac{1}{49}$ $\frac{1}{50}$ $\frac{1}{51}$ $\frac{1}{52}$ $\frac{1}{53}$ $\frac{1}{54}$ $\frac{1}{55}$ $\frac{1}{56}$ $\frac{1}{57}$ $\frac{1}{58}$ $\frac{1}{59}$ $\frac{1}{60}$ $\frac{1}{61}$ $\frac{1}{62}$ $\frac{1}{63}$ $\frac{1}{64}$ $\frac{1}{65}$ $\frac{1}{66}$ $\frac{1}{67}$ 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DEG XYZ HEX R= 'X'
{HOME}

34.1.25•COS(43◊)

EDIT CURS BIG ▢ EVAL FACT0 SIMP

Figure 11

(ENTER) (R) →NUM

DEG XYZ HEX R= 'X'
{HOME}

7:
6:
5:
4:
3:
2:
1: 31.0825

EDIT VIEW RCL STOP PURGE/CLEAR

Figure 12

(R) EQW BIG ▢ (to make the displayed font smaller if not already selected)
5 + 3 4 × / • 2 5 × SIN 4 3 ► ► —
0 • 5 × 3 2 × / • 2 5 Y^x 2

DEG XYZ HEX R= 'X'
{HOME}

5+34.1.25•SIN(43)–0.5•32.1.25²

EDIT CURS BIG ▢ EVAL FACT0 SIMP

Figure 13

(ENTER) (R) →NUM .

DEG XYZ HEX R= 'X'
{HOME}

7:
6:
5:
4:
3:
2: 31.0825
1: 8.9849

EDIT VIEW RCL STOP PURGE/CLEAR

Figure 14

Answer: The value of X is 31.0825 and the value of Y is 8.9849. The object is 31.08 feet down range and is still 8.98 feet above the horizontal ground.

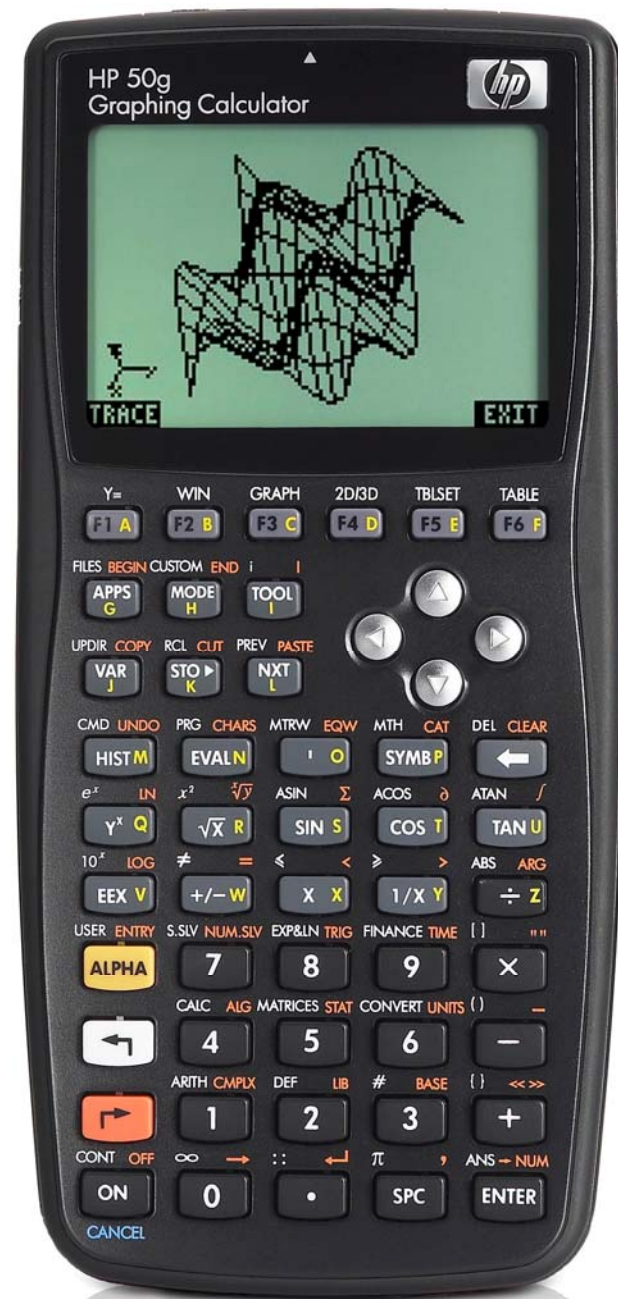


hp calculators

HP 50g Using the EquationWriter – Part 2

The EquationWriter

Practice manipulating formulae in the EquationWriter



The EquationWriter

One of the most useful built-in applications of the HP50g is the EquationWriter. This is the best environment for writing, editing and mathematically manipulating formulae. The EquationWriter allows quick and easy work that is very difficult or even impossible to do from the command line. It displays formulae in textbook format, allowing a much easier recognition of terms than the command line since the need to keep track of parentheses is reduced to a minimum. In addition, all commands for formula manipulation can be used, making thus the EquationWriter to a full flavoured environment for work with algebraic objects.

You access the EquationWriter with $\boxed{\rightarrow}$ EQW.



Figure 1

The blinking arrow is the cursor of the EquationWriter. Anything you write is placed at the position of the cursor. The menu items in brief are:

EDIT : Allows to edit a sub expression separately in the command line.

CURS: Switch cursor modes

BIG: Switch font used for display

EVAL: Evaluate sub expression

FACTOR: Factor sub expression

SIMP: Simplify sub expression

(Second menu page)

CMDS: Display the CAS commands catalogue

HELP: Get help for the CAS commands

You can display any menu from inside the EquationWriter, select some of its commands and place it in the EquationWriter (if it is the command is a function allowed in algebraic objects). You can also apply some command from any menu to a sub expression in the EquationWriter, if the command returns one algebraic object.

In the following examples we practise using the features of the EquationWriter to write, edit, and mathematically manipulate expressions.

Practise manipulating formulae in the EquationWriter

Example 1: Write the expression below in the EquationWriter:

$$1 + \frac{1}{x^2 \cdot \sin(x) + \frac{1}{x^2 \cdot \sin(x) + \frac{1}{x^2 \cdot \sin(x)}}}$$

Solution: Assume RPN mode and soft menus. Start the equation writer.

$\boxed{\rightarrow}$ EQW

RAD XYZ HEX R= 'H'
{HOME}



EDIT CURS BIG ■ EVAL FACTO SIMP

Figure 2

Begin writing the formula

$\frac{1}{1 + \frac{1}{x^2 \cdot \sin(x)}}$

RAD XYZ HEX R= 'H'
{HOME}

$$1 + \frac{1}{x^2 \cdot \sin(x)}$$

EDIT CURS BIG ■ EVAL FACTO SIMP

Figure 3

The sub expression $\frac{1}{x^2 \cdot \sin(x)}$ has to be written another two times. Select it and copy it.

CURS

RAD XYZ HEX R= 'H'
{HOME}

$$1 + \frac{1}{x^2 \cdot \sin(x)}$$

Figure 4

The EquationWriter has switched to a special mode that allows easy selection of sub expressions. The cursor changed to cross hairs. The selected sub expression is variable X of the sine function. Press Δ and hold the key pressed until the cursor doesn't move any more. Release the key. Now the sub expression is selected that we want to copy.

RAD XYZ HEX R= 'H'
{HOME}

$$1 + \frac{1}{x^2 \cdot \sin(x)}$$

Figure 5

Δ (accept the selection and return to normal selection mode)

RAD XYZ HEX R= 'H'
{HOME}




$$1 + \frac{1}{x^2 \cdot \sin(x)}$$

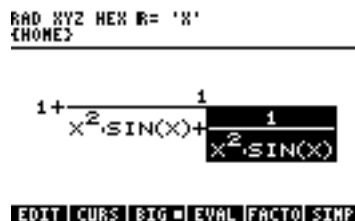
EDIT CURS BIG ■ EVAL FACTO SIMP

Figure 6

 **COPY** (copy the selected sub expression)

Continue writing the formula and paste the copied sub expression.

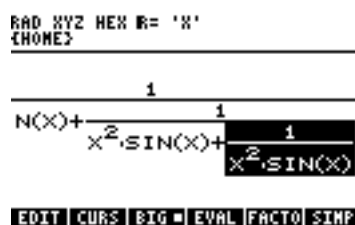
   **PASTE**



$$1 + \frac{1}{x^2 \cdot \sin(x) + \frac{1}{x^2 \cdot \sin(x)}}$$

Figure 7

   **PASTE** (repeat another time)

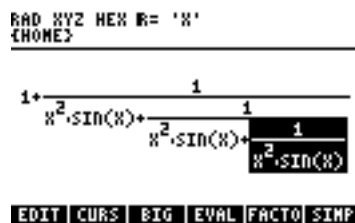


$$N(X) + \frac{1}{x^2 \cdot \sin(x) + \frac{1}{x^2 \cdot \sin(x)}}$$

Figure 8

The formula is too big and doesn't fit completely in the screen. Switch to small font display.

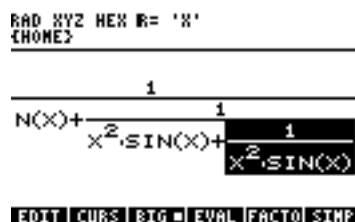
BIG



$$1 + \frac{1}{x^2 \cdot \sin(x) + \frac{1}{x^2 \cdot \sin(x) + \frac{1}{x^2 \cdot \sin(x)}}}$$

Figure 9

BIG (switch back to big font display)



$$N(X) + \frac{1}{x^2 \cdot \sin(x) + \frac{1}{x^2 \cdot \sin(x)}}$$

Figure 10


 (put the formula in the command line or on the stack)

Figure 11

Answer:

$$1 + \frac{1}{x^2 \cdot \sin(x) + \frac{1}{x^2 \cdot \sin(x) + \frac{1}{x^2 \cdot \sin(x)}}}$$

Example 2: Factor the expression $(\sin(x) - \sqrt{3}) \cdot x^2 + (\sin(x) - \sqrt{3}) \cdot (-1 + \sqrt{2}) \cdot x - (\sqrt{2} \cdot \sin(x) - \sqrt{6})$

Then re-expand the expression leaving factors with trigonometric terms untouched.

Solution: Start the equation writer and enter the expression.

Figure 12

(select the whole expression and factor it)

Figure 13

(select the first two factors and expand them)

Figure 14

(enter the manipulated expression on the stack)

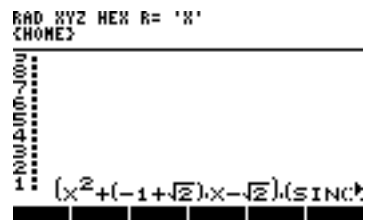


Figure 15

Answer: $(x^2 + (-1 + \sqrt{2})x - \sqrt{2})(\sin(x) - \sqrt{3})$