

Expression calculator

Introduction

Expression Calculator

Written by WILLEMS Gunther

<https://guntherwillems.com/expression-calculator>

This program is Freeware

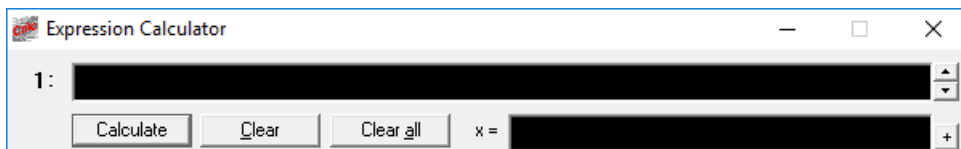
With the calculator you can:

- Calculate expressions of an infinite length and complexity.
 - Store an infinite number of lines containing expressions for reference or later use.
 - Create an infinite number of user variables.
 - Create an infinite number of user functions with up to three parameters.
 - Save all the preceding possibilities for later use.
-
- Draw two-dimensional graphics.

Infinite means as long as your memory can support it.

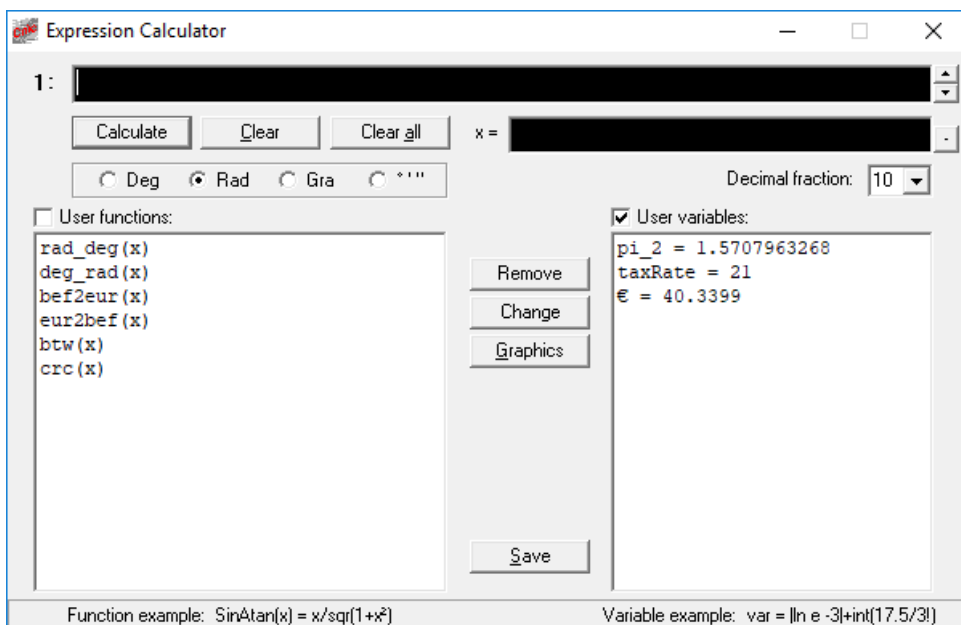
Main window

Small window



(click the + button to open the full window)

Full window



Graphics window

Graphics options

Function:

Window width: Label ticks x:

Window height: Label ticks y:

Image width: Ticks x:

Image height: Ticks y:

Origin x: Color graph:

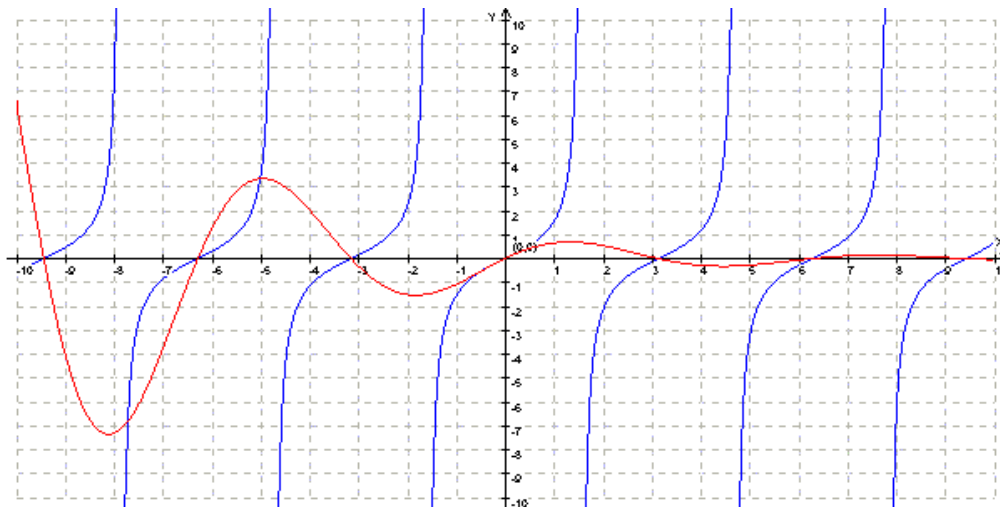
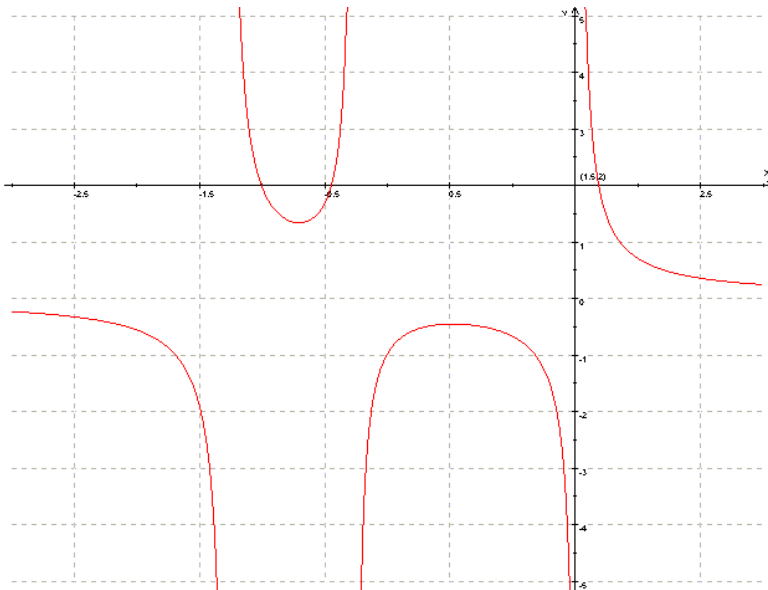
Origin y: Show gridlines

Minimum x: Clear previous graph

Maximum x: Use points

Minimum y:

Maximum y:



Function overview

The following functions are built-in:

Trigonometric functions:

sin(x)	sine
cos(x)	cosine
tan(x)	tangent

Inverse trigonometric functions:

asin(x)	arc sine
acos(x)	arc cosine
atan(x)	arc tangent

Hyperbolic functions:

sinh(x)	hyperbolic sine
cosh(x)	hyperbolic cosine
tanh(x)	hyperbolic tangent

exp(x)	exponential: e^x
ln(x)	logarithm base e
log(x)	logarithm base 10, natural logarithm

sqr(x)	square root
cur(x)	cubic root

int(x)	integer part
floor(x)	floor finds the largest integer not greater than x
ceil(x)	smallest integer greater than
abs(x)	absolute value, or use $ x $

sgn(x)	Sign: -1 for $x < 0$, 0 for $x = 0$, 1 for $x > 0$
frac(x)	Fractional part of number
fact(x)	Factorial : $x! = x(x-1)(x-2)\dots 1$ or use $x!$ or $(x+1)!$

min(x,y)	minimum
max(x,y)	maximum
mod(x,y)	x modulo y, or $x \% y$, the remainder on dividing x by y
round(x,y)	rounds x to y values after decimal point

Constants

The calculator knows these two constants: (However, you can create as many values as you wish!)

e Euler's constant (or Euler-Mascheroni constant): base of natural logarithm : 2.7182818285...
pi the ratio of circumference of a circle to its diameter: 3.1415926536...

User variables

You can define an infinite number of variables.

In the expression line enter:

variablename = value

The name that you choose for a variable can be of any length, but it must start with a letter. The rest can be any character except a space or +-* / ^ | ! ^

Everything is case sensitive. So the name "FreeFall" is not the same as "freefall"!

The value can be any number or expression (in this case the result of the expression will be used).

The calculator only knows two variables 'pi' and 'e'. You can assign another value to them. When removing your assignment for 'pi' and 'e', the original values will be available again.

Some examples:

g = 9.80665 (Free fall)
c = 299792458 (Speed of light)
G = 6.672E-11 (Gravitation)
Vm = 2.241383E-2 (Ideal gas)
pi = 355/113 Tsu Ch'ung-Chi's value: approximates pi to 6 places

User functions

You can define an infinite number of functions.

In the expression line enter:

1) A function with one parameter:

functionname(x) = expression

The name you choose for a function can be of any length, but it must start with a letter. The rest can be any character except a space or +-* / ^ | ! ^

Everything is case sensitive. So the name "SinAtan(x)" is not the same as "sinatan(x)"!

Some examples:

f(x) = x²+1
bef2eur(x) = x/40.3399
g(x) = (f(x))²-f(x)+1
func1(x) = 3x³+5x²+10x-1

2) Two parameters:

functionname(x,y) = expression

binominal(x,y) = x! / (y! * (x-y)!)

3) Three parameters:

$$h(x,y,z) = x^2+3y*z$$

Expression:

Equivalent:

f(13)

f 13

sin(f(13))

sin f 13

h(sin 23.5, 5+2,
f(2))

bef2eur(1 000)

Expression syntax

Whenever you enter an expression, the calculator evaluates the expression and returns the result.

Operators are used to perform calculations, make assignments.

+ Addition

- Subtraction

* Multiplication

/ Division

= Assignment

! Factorial (or fact function)

% Modulus (or mod function), gives the remainder of a division

. Decimal point

, Separator for function parameters

Space for readability

Order of precedence:

()

2 3

unary -

^

* / %

+ -

Spaces can be used for readability:

Also inside values

Expression:

Equivalent:

$x^2+1456376*(4!+2)$

$x^2 + 1\ 456\ 376 * (4! + 2)$

Examples: (The two notations are correct)

<u>Expression:</u>	<u>Equivalent:</u>	
x^2	x^2	
x^3	x^3	
$\sin x$	$\sin(x)$	
$\sin x^2$	$\sin(x^2)$	
$\sin x^{\wedge}2$	$(\sin(x))^2$	
$x!$	$\text{fact}(x)$	
$ x $	$\text{abs}(x)$	
$10^{\circ}12'14''$	$10\text{d}12\text{m}14\text{s}$	$10\text{h}12\text{m}14\text{s}$
-10^2	$-(10^2)$	
$\sin x^2$	$\sin(x^2)$	
$\sin x^{\wedge}2$	$(\sin x)^2$	
$\sin -10$	$\sin(-10)$	
$\sin -10^2$	$\sin(-10^2)$	
$3x+7(12+3)$	$3*x + 7*(12+3)$	
$\sin(\tan(\pi))$	$\sin \tan \pi$	

You can define variables that can be used in your expressions: see [User variables](#)

You can define functions with up to three parameters: see [User functions](#)

Advanced topics

- Functions defined with leading # sign are hidden. To see them check the checkbox 'User functions' until it is grayed.

`#test(x,y) = 15x+y2`

To use the function do not use the leading # sign! Just type:

`test(5)`

- Adding remarks to your expressions and functions:
All characters found after a ';' are considered being comments

Defining a function:

`rad_deg(x) = x*180/pi ; Convert radians to degrees`

`deg_rad(x) = x*pi/180 ; Convert degrees to radians`

After an expression:

`355/113 ; Almost pi`

Examples

$$16/113+3$$

$$(12*3+1)*7-5$$

$$\sin(\pi/4)$$

$$\cos -10.2$$

$$12^{\circ}3' + 15'34''$$

$$12\text{h}3\text{m} + 15\text{m}34\text{s}$$

$$10\,000 + 20\,540 + 7\,070 \quad ; \text{ money needed next month}$$

$$(15-6*2)!$$

$$7 + |-45*2.3|$$

$$a = 15.5/4-4$$

$$\pi_2 = \pi / 2$$

$$\text{rad_deg}(x) = x*180/\pi ; \text{ Convert radians to degrees}$$

$$\text{deg_rad}(x) = x*\pi/180 ; \text{ Convert degrees to radians}$$

$$\text{bef2eur}(x) = x/40.3399 ; \text{ Convert BEF to EUR}$$

$$\text{eur2bef}(x) = x*40.3399 ; \text{ Convert EUR to BEF}$$

$$\text{btw}(x) = x*1.21 ; \text{ Add 21\% btw to } x$$

$$f(x,y) = x*3+y$$

$$g(x) = x^2+1$$

$$h(x,y,z) = x+y*z$$

$$i(x,y) = g(x) / 2 + y$$

$$a = \text{deg_rad}(45)$$

$$b = \sin a$$

$$\text{rad_deg} \sin(\pi/4)$$

$$\sin \text{deg_rad } 45$$

$$f(4,3)$$

$$f(g(3), 2)$$

$$-4 + h(g(3)*2, f(g(1), 3), -4)$$

$$l(2, 6)$$

$$(x^2+1)/(2x^3-4x-1)$$

$$\sin x * \exp(-.25x)$$

Graphics

The "Expression Graphics" program can draw 2 dimensional functions of type: $f(x) = x^2+1$
All the user functions and variables saved with the "Expression Calculator" can be used.

Here you can insert all the parameters needed to draw a function.
If label ticks x or y equals zero, the axis will be divided into 20 ticks.

To draw a new graphic, click inside the graphics image. The options dialog box will reappear.

Examples:

$\tan x$

$2x^3-4x^2+5$

$\sin(x)*\exp(-.25x)$

$4x-7\sin x$

$(x^2-5x) / (2x^2-5)$

Screen parts

Expression

Enter your expression in this edit box. Press 'enter' or click on the 'Calculate' button for evaluation and calculation of the result.

Use the up and down arrow to move between expression lines or use the buttons on the right side.

Gotoexpr

Use up or down arrow to go to the next or previous expression line. After the last expression a new empty line is created.

Exprlinenr

The active expression line.

Result

Shows the result of the last calculation.

Calculate

Evaluates and calculates the expression show in the expression line above.

Clear

Clears and deletes the active expression line. It is removed from memory.

Clearall

Clears and deletes all the expression lines present in memory.

Degrees

Degrees, radians, gradients and degrees/minutes/seconds mode for calculation of the result

Userfunction

Show all the functions created by the user. By clicking one time on a function it is highlighted and the formula is shown in the status bar. Double clicking on a function puts the function inside the expression line at cursor position.

Uservariables

Show all the variables created by the user. By clicking one time on a variable it is highlighted. Double clicking on a variable puts the variable name inside the expression line at cursor position.

Functionbox

When unchecked, all the function names are shown.

When grayed, all the function names from normal and hidden functions are shown.

When checked, all the function names are shown + function definitions.

Variablesbox

When unchecked, all the variable names are shown.

When checked, all the variables and the value they represent are shown

Remove

Remove the selected user function and/or user variable.

Change

Places the function definition inside the expression line. Change the function definition and press the calculate button.

Graphics

Opens the "Expression Graphics" program and passes the current expression to it. All the functions and variables saved in ExpCalc.ini are usable with the graphics program.

Save

Saves all the expression lines, user functions and user variables to the ExpCalc.ini file located in the same directory as the program.

Statusbar

Shows an example function and variable definition.

Shows the last user function selected by the user.

To remove the last function definition click once on the status bar.

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