

# Caos Graph

Welcome to Caos Graph. This tool lets you draw one or more graphs from an expression you type. Whether you are a student, scientist, or just plain mathematician, Caos Graph helps you draw those expressions easily and quickly.

See [Release History](#) for more information.

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# Understanding the basics

## Graphs

Graphs are a graphical representation of an **expression** in a coordinate system.

## Coordinate systems

A coordinate system is an area limited by values. It consists of a X-axis and a Y-axis. Expressions are drawn relative to these axes.

## Expressions

An expression is a set of X-values matching a set of y-values:

$$f(x) = x$$

In this program you do not have to type the  $f(x)=$ , just type the following.

The above function gives the matching Y-value for each X-value along the X-axis. What Caos Graph does, is that it replaces the right X with values ranging from minimum to maximum, and draw the corresponding Y-value in the coordinate system (within the borders of course).

A X-value of 0 will, in this example give a Y-value of 0. X=1 gives a Y-value of 1 and so on.

You are allowed to type complex expressions, and use functions, like this:

$$f(x) = \sin(x)*x^2$$

Remember that you may not type the  $f(x) =$  part, just the expression.

## Sub-expressions

Sub-expressions is grouped by a parenthesis ( ), and is calculated as a unit, just like ordinary math with parenthesis:

$$f(x) = \cos(x-(2*x))$$

# Using the program

## The coordinate system

The coordinate system is displayed at the top and will scale along with the application. Move the mouse over the coordinate system, and you will see that the mouse pointer changes to a **crosshair** pointer. Below the coordinates is the absolute position of this crosshair.

### Functions:

- Mouse buttons: Zoom in/Out
- *View|Coordinates*: Change coordinate settings.

## The expression field

The expressions is typed in the **expression field** (at the bottom of the application), which consists of a expression **history list** and expression edit field.

The history list remembers the last 20 expressions you have typed. Each expression can be saved in **projects**.

Type in you expression in the expression edit field like this:

**sin(x)**

And press enter. If the syntax is correct, the expressions is drawn right away in the coordinate system. It is also saved in the history list.

### Functions:

- *Enter*: Draw expression
- *Ins*: Edit last expression
- *Ctrl+S*: Save the expression in the project list.

## The history list

This feature remembers the last 20 graphs.

### Functions:

- Double click: Edit expression
- *Save/Ctrl+S*: Save chosen expression in the project list.

# Program parameters

You can also parse parameters to Graph:

**-e<expression>**

Draw single expression in coord system.

Example: **graph.exe -esin(x)**

**-f<file>**

Draw graphs in project file. The file has to be a valid Graph Project file (.gpj)

Example: **graph.exe -f5xsin.gpj**

**-minx<value>**

Minimum x value in coordinate system. Valid values are -10000 - -1

Example: **graph.exe -minx-5**

**-maxx<value>**

Maximum x value in coordinate system. Valid values are 1 - 10000

Example: **graph.exe -maxx5**

**-miny<value>**

Minimum y value in coordinate system. Valid values are -10000 - -1

Example: **graph.exe -miny-5**

**-maxy<value>**

Maximum y value in coordinate system. Valid values are 1 - 10000

Example: **graph.exe -maxy5**

**-res<value>**

Graph resolution in coordinate system. Valid values are 50 - 5000

Example: **graph.exe -res1000**

## Combining statements

Caos Graph processes the parameters in sequence. That means that parameter 1 will be executed before parameter 2 and so on...

An example:

**graph.exe -minx5 -miny5 -maxx8 -maxy8 -e8\*sin(x)**

The parameters will set the coordinate system to -5,5 and -8,8; then draw the expression  $8*\sin(x)$ .

# Open and save projects

You can open and save projects.

Projects are made by saving multiple expressions in a project list, so they can be displayed together.

- *File|Open project...*      Open a project
- *File|Save project as...*      Save a project

See also: [projects](#).

# Save As...

Type in the filename and press save. The graph will be saved.

You can choose between the following file types:

- **BMP**: The standard Windows Bitmap.
- **WMF**: Windows Metafile.

**NOTE!** At this moment, the saved .WMF files are not compatible with either the Microsoft Office .WMF file or the Paint Shop Pro files.  
This is because the files does not contain any adobe header.

To choose the size of the saved image, 2 modes are available, and can be set up in the setup:

- Use same size as on screen. This mode will allow you to distort the graph as much as you please.
- Use a fixed size, where you choose the size per unit.

# Coordinates (ctrl+o)

The coordinates view is used to set the graphs **min** and **max** values. It is also used to set the graph **resolution**.

Min values range from -10000 to -1

Max values range from 1 to 10000

Resolution range is from 50-5000

**The new settings is not valid before you press "Use".**

The graph resolution determines how many calculations are used to draw the graph from X-min to X-max.

To get a **accurate draw** of the graph, select a resolution equal or higher than the coordinate system absolute pixel value.

You can see the resolution by pressing *F12* or by selecting View|Info from the menu bar.

Beware that the maximum number of calculations possible is 16384. If you have 5 graphs with a resolution of 2000 each, 10000 calculations is used.

# Project (ctrl+p)

Graphs can be bundles into projects. A project is a set of graphs **drawn at the same time**.

In the main screen, select *Edit|Save* last graph (*Ctrl+S*) to save the last drawn graph in the project list. You can also select a graph from the history list, and press the button "Save".

When a project is drawn, a "MUL" occurs, indicating that you are drawn multiple graphs. The "MUL" (and multiple graph drawing) is turned off when selecting an expression from the expression edit field.

## Functions

- *Button1* : Draw all graphs. Draws the graphs.
- *Button2* : Delete graph. Deletes the selected graph.
- *Button3* : Delete all graphs. Deletes all graphs in list.

In main window:

- Select *File|Open project...* to load a saved list of graphs.
- Select *File|Save project...* as to save the list.

## NOTE!

Beware that the maximum number of calculations possible is 16384. If you have 5 graphs with a resolution of 2000 each, 10000 calculations is used.



# Info (F12)

The info shows various information about the graph, coord system and surroundings.

- **Coordinate size:** The XxY size of the coordinate system.
- **Size in pixels:** The actual pixel size of the coordinate system.
- **Screen size:** The desktop resolution.
- **Number of graphs:** The number of graphs drawn.
- **Resources used:** A percentage bar showing how much of the graph resources is used.

# Find X Value

This function lets you find a X value according to a Y-value selected by you. If multiple graphs is shown, the listbox will contain a section for each graph.

Type the Y-value in the edit field *Find where Y=*.

The *margin* is used to select in which range the X-values must appear.

Selecting a Y-value of 0 and a margin of 0.1, gives you the X-value with the Y-value closest to 0, within the margin of -0.1 - 0.1.

The X-value found is from the values actually calculated. To have more accurate values, you can **choose a higher resolution** in View|Coordinates.

# Calculator (F8)

The calculator is a small but powerful help when in need of a calculation.

Type in the expression you wish to calculate:

**2+2**

The result is shown as a numbered history list. Press *Clr* to clear the list.

Press *Eval* to evaluate expression.

## Functions:

All functions from the expression is available here. Typing X, will give the function where x=0:

$f(0) = <expression>$

- *MR*: Memory recall. Add the last result.
- *MC*: Memory clear.
- *M+*: Memory add. Fill the memory with the last result.
- *Clr*: Clear list.

# Graph Analyzer

The graph analyzer gives information about the graph(s). If multiple graphs is shown, the listbox will contain a section for each graph.

## Min and max values

A max value is defined as the point where a graph goes from an ascending curve angle to a descending curve angle.

A min value is defined as the point where a graph goes from a descending curve angle to an ascending curve angle.

The min and max values is represented as one X,Y coordinate, even if multiple min or max points exists with the same value - for example a sinuscurve.

## f(0)

The f(0) value is where the curve cuts the Y-axis. The value is represented as the Y-value, since the X-value is given (zero).

# Integral Calculation

The integral calculation is the calculation of an area between 2 graphs, one could be the X-axis. The calculation is based upon an approximation of the graph. The integral area is sampled with the "frequency" given in Graph Resolution (see [View|Coordinates](#)). The higher resolution, the more accurate calculation.

## Calculating integral

In the fields in the *Find Between* box, you select the two graphs you wish to calculate integral for. To get positive values, the graph with the highest y-value has to be in the topmost field. One of the graphs is the **X-axis**, and is indicated by 0.

Select the X boundaries in *Min X* and *Max X*. The bounds has to be within the graph area on screen, but can be any number you like.

Press *Find* to calculate the integral value.

Select *Absolute* if you would like the result as an absolute value (negative values are not subtracted but added to the result).

## Drawing integral on graph

On default, the integral area is automatically drawn in the coordinate system.

In the [Setup](#), under Integral, you can select whether you want Graph to always draw integral, never draw or ask.

The integral area can be deleted with *Ctrl+I*, or with *Edit|Clear integral*.

# Curve angle

This function allows you to calculate the angle of a certain point on a graph. If multiple graphs is shown, the listbox will contain a section for each graph.

In *Find Where X*, you insert the X-point of the point you wish to find angle for.

Press *Find* to calculate angle. The result is shown as:

- Factor: How many Y units per X unit.
- Angle in radians.
- Angle in degrees.

# Setup

A setup is provided to change factory defaults. Select **OK** to accept changes, **Cancel** to discard.

## General

### Precision

The number of decimals to see can be selected here. Range is 0-10. The settings will affect precision globally along the program.

### Remember

Is used to select which settings must appear next time you open the Caos Graph.

- Window size.
- Window position.
- Coord position: Remembering the coordinate min and max values and the graph resolution.

### Color

Select the desired background for the coordinate system.

## Coord system

- **Color:** Select the color of the coordinate system.
- **Thickness:** Select the thickness of the coordinate system lines in pixels. Range is 1-20.

### Markers

Markers is numbers along the coordinate axis.

- **Markers numbers:** Select markers on/off.
- **Font size:** Select font size. Range is 2-7. Default font is SmallFont.

### Marker distance

- **X distance:** The distance in units on the X-axis.
- **Y distance:** The distance in units on the Y-axis.

#### Grid

- **Grid on:** Select grid on/off.
- **Color:** Select grid color.
- **Thickness:** Select grid thickness in pixels. Range is 1-20.

## Graph

- **Color:** Select the color of the graph. Multiple graphs is drawn in the same color.
- **Thickness:** Select the thickness of the pixels. Range is 1-20.

## Integral

- **Color:** Select the color of the integral area.
- **Thickness:** Select the thickness of the pixels. Range is 1-20.
- **Draw on graph:** When integral is calculated you can select to always draw the graph (when integral window is closed), never draw integral, or ask first (on integral window close).

## Save

Here you set up how the graph should look like when saved as .BMP, .WMF or copy to clipboard (Ctrl+C).

- **Use same resolution as on screen:** Select this, if you wish to save the graph with the exact same size as on the screen.

*This only works if the above is unchecked:*

- **X resolution:** The X resolution per unit for the saved file.
- **Y resolution:** The Y resolution per unit for the saved file.

*About X and Y resolution:*

Imagine a coordinate system with the following dimensions:

**MinX:** -5  
**MaxX** 5  
**MinY** -5  
**MaxY** 5

When selecting an X size 20 and a Y size 20, your saved image will **NOT** be 20x20 pixels, but each unit will be 20x20 pixels. That means that the total size of the image will be 200x200 pixels, since there are 10 units in the X direction and 10 units in the Y direction.



# Functions

The following functions is supported by Caos Graph:

<u>exp(x)</u>	Exponential of x
<u>abs(x)</u>	Absolute value of x
<u>ln(x)</u>	Natural logarithm of x
<u>frac(x)</u>	Fractional part of x
<u>min(x,n)</u>	x, if x<n
<u>max(x,n)</u>	x, if x>n
<u>sqrt(x)</u>	Square root of x
<u>sqr(x)</u>	Square of x
<u>cos(x)</u>	The cosine of x
<u>sin(x)</u>	The sine of x
<u>tan(x)</u>	The tangent of x
<u>atan(x)</u>	The arc tangent of x
<u>x^n</u>	X powered by n

# **exp(x)**

The Exp function returns the exponential of X.

The return value is e raised to the power of X, where e is the base of the natural logarithms.

Syntax: `exp(<expression>)`

Example: `exp(1) = 2.7183`

# abs(x)

The Abs function returns the absolute value (non-negative) of the argument.

Abs(0) = 0

Abs(-1) = 1

Abs(1) = 1

Syntax: abs(<expression>)

# **ln(x)**

The Ln function returns the natural logarithm ( $\ln(e^n) = n$ ) of the expression X.

Syntax: `ln(<expression>)`

# frac(x)

The Frac function returns the fractional part of the argument X.

$\text{frac}(1) = 0$

$\text{frac}(1.25) = 0.25$

$\text{frac}(99.99) = 0.99$

Syntax:  $\text{frac}(\langle \text{expression} \rangle)$

# min(x,n)

Min(x,n) returns all X-values below n.

min(0,1) = 0

min(1,1) = 1

min(2,1) = 1

Syntax: min(<expression>, <expression>)

# max(x,n)

Max(x,n) returns all X-values above n.

min(0,1) = 1

min(1,1) = 1

min(2,1) = 2

Syntax: max(<expression>, <expression>)

# sqrt(x)

The Sqrt function returns the square root of the argument.

Syntax: sqrt(<expression>)

Example: sqrt(9) = 3



# **sqr(x)**

The Sqr function returns the square of the argument.

Syntax: `sqr(<expression>)`

Example: `sqr(5) = 5*5 = 25`

# **cos(x)**

The Cos function returns the cosine of the angle X, in radians.

Syntax: `cos(<expression>)`

# **sin(x)**

The Sin function returns the sine of the argument in radians.

Syntax: `sin(<expression>)`

# **tan(x)**

The Tan function returns the resulting tangent of the argument.

Syntax: `tan(<expression>)`

# atan(x)

The ArcTan function returns the resulting arctangent of the argument.  
You can calculate other trigonometric functions using Sin, Cos, and ArcTan in the following expressions:

$$\text{Tan}(x) = \text{Sin}(x) / \text{Cos}(x)$$

$$\text{ArcSin}(x) = \text{ArcTan}(x/\text{sqrt}(1-\text{sqr}(x)))$$

$$\text{ArcCos}(x) = \text{ArcTan}(\text{sqrt}(1-\text{sqr}(x)) / x)$$

Syntax: atan(<expression>)

# X^n

X^n results the value of X powered by n.

$$2^2 = 2*2$$

$$2^4 = 2*2*2*2$$

Syntax: *<expression>*^*<expression>*

# About Caos Graph

**Caos Graph is (c) 1997 Caos Development.**  
All rights reserved.

Programming and design:  
**Brian Pedersen.**

This Program is Shareware, and may be distributed freely if distributed in its entirety, and without any changes except for compressing purposes.

The CAOS Graph is distributed as-is. The author disclaims all warranties, expressed or implied. The author will assume no liability for damages either from the direct use of this product or as a consequence of the use of this product.

**See also:**  
[Registration.](#)  
[Release history.](#)

# Release history

## version 2.0 (*feb. '98*):

**New function: Graph Analyzer**  
**New function: Integral calculator**  
**New function: Curve angle calculator**  
**General improvements:**

All lists can have their output copied to clipboard.  
Improved display in lists. Now with indents, bolds and lines.  
Graph now goes shareware. See [registration](#) for prices.

## version 1.1 (*dec. '97*):

**New file type: BMP**  
**Option for copy to clipboard as .BMP**

Improved calculator.  
Help file bug corrected. The help file is now compiled with a 16 bit help file compiler.

## version 1.0 (*nov. '97*):

13 simple functions supported.  
Built-in project manager for drawing multiple graphs.  
Built-in calculator.  
Graph and environment information.  
Set up colors, line thickness, grid, grid spacing, numbers on grid, number of decimals shown.  
Graph resolution 50-5000 points.  
Remember position, size and grid size.  
On-line help.

### **Known bugs:**

The saved .WMF files are not compatible with MS Office of Paint Shop Pro.

### **See also:**

[About Caos Graph](#)  
[Registration](#)



# Registration

This version (**2.0**) of Caos Graph is **not freeware**. You are privileged to use the program for 30 days. After 30 days you either have to register or delete Graph from you computer.

You are welcome to use the prior versions at no cost.

## By registering you...

- **Encourages** the further development of Graph and other useful or entertaining applications.
- Pays for one half hour of the more than **100 hours** spent on developing this program.
- Have **unlimited support** on Graph **via e-mail**. Any questions regarding graph will kindly be answered by me personally.
- Entitles you to **freely** download any bugfixes and upgrades until version 3.0.

## Prices

### 1-user license:

This license gives the right to install the program on 1 computer.

For users inside Denmark: Dkr 60.-

For users outside Denmark: us\$ 10.-

The registration covers one copy of either the 16-bit version or the 32 bit.

### Multi-user license:

This license gives the right to install the program on all computers inside the registered company, educational institute or government. It does not give the right to distribute it upon members, students, or employees' personal computers.

For users inside Denmark: Dkr 600.-

For users outside Denmark: us\$ 100.-

The registration covers all copies needed to cover the entire company, educational institute or government of either 16-bit or 32-bit versions.

The intention of the multi-user license is to give educational institutes and others with a large quantity of computers an opportunity to install Graph on all their PC's without spending a fortune. And thereby giving all employees (and/or students) a chance to use Graph in their work or study.

## How to register:

Send a letter to:

**Caos Development**  
**att.: Brian Pedersen**  
**Brandtsgade 8A 1.**  
**Dk-4700 Næstved**  
**Denmark**

Please remember to include:

The **Username** you wish to have.

Your **company** name.

Your **e-mail** or **postal address**.

Include a **cheque or money order** on the amount matching the registration requested.

If you wish to have the registration sent by e-mail, please allow up to 1 week of handling.

If you wish to have the registration sent by letter, please allow up to 3 weeks of handling.

