

# **The KFormula Handbook**

**Jonathan Drews, Anne-Marie Mahfouf, Alfredo  
Beaumont Sainz, and Ulrich Küttler**



The KFormula Handbook

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## **Abstract**

KFormula is used to layout formulas.

# Chapter 1

## Introduction

KFormula is used to write formulas. It doesn't evaluate anything. All it does is print them.

KFormula was designed for your editing pleasure. It makes it delightful to enter Greek letters, fractions and all the stuff that makes a formula look like a formula.

But most of the time you won't want to use KFormula itself. Instead you might choose to use it from within KWord or any other KOffice application. That is KFormula is not a useful application on its own but an extension to all the other KOffice applications you've fallen in love with.

Where ever KFormula gets embedded, it will behave the same.

## Chapter 2

# Basics

A new (empty) KFormula document looks like a small blue square. This square stands for the central idea of KFormula. It represents an empty list. The idea of KFormula is to have different elements arranged in lists. An element in this respect might be a single char or a root symbol or something like that. The lists are put together so that they form a formula. That is there are lists for indexes, lower and upper bounds and so on. And of course there is the main list, which we've already seen.

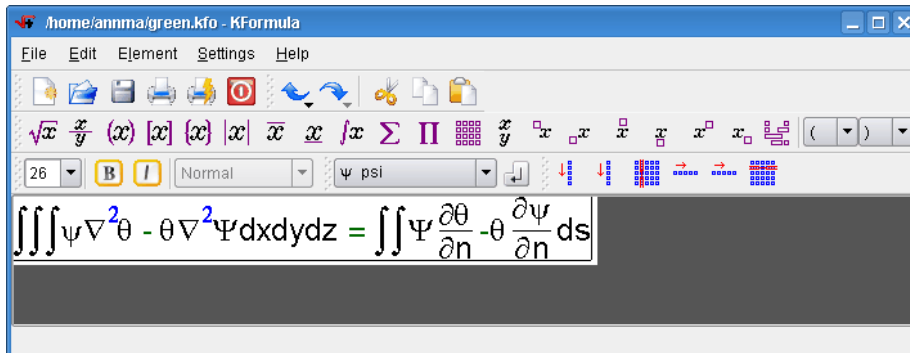
Writing a formula means to fill the empty list with letters, figures and mathematical symbols. That is straightforward: use your keyboard. As soon as you type something the 'empty' symbol will vanish and you will see whatever you have inserted instead. New characters are always put at the current cursor position.

There is a toolbar called Add that allows you to create more complex elements. There are indices, fractions, roots and matrices to name a few. All these elements consist of at least one list, you can move the cursor into and insert new items.

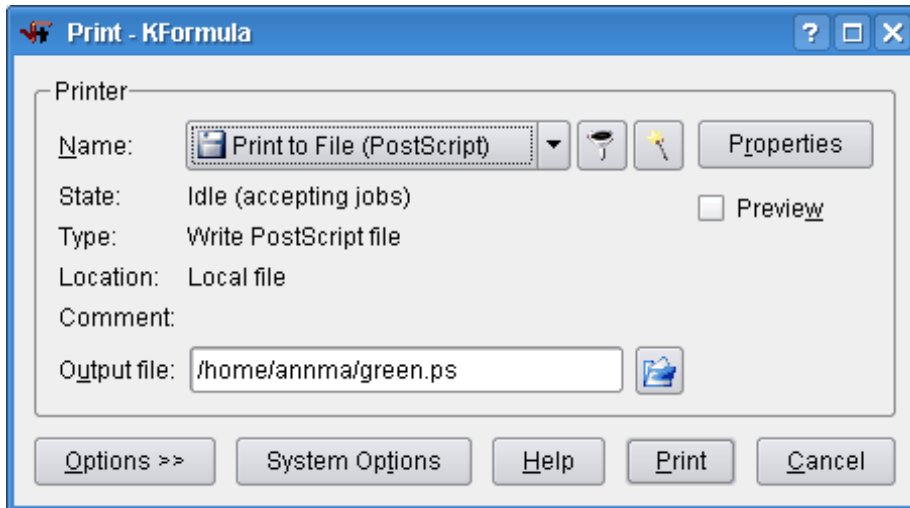
## Chapter 3

# Using KFormula

Below is a typical formula entry in KFormula. To enter the partial derivatives and Greek letters click on the symbol combo box, on the right, and select the appropriate symbol. The symbol combo box, in the figure below, has the word 'Cap' on it. Click on the return key symbol to the right of it, to enter a symbol.



The Greens formula above can be printed to a PostScript® file. To do that choose File → Print and configure print as shown below:




Here is what the resulting PostScript® file should look like:

$$\iiint \psi \nabla^2 \theta - \theta \nabla^2 \psi \, dx dy dz = \iint \psi \frac{\partial \theta}{\partial n} - \theta \frac{\partial \psi}{\partial n} \, ds$$

### 3.1 More KFormula features

More on formulas

To enter matrices, click on the [ ] and then click on the matrix symbol . You can move from matrix element to matrix element using the arrow keys Right arrow, Up arrow, Down arrow and Left arrow. An example matrix is shown below.

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

## Chapter 4

# Command Reference

### 4.1 The Main KFormula Window

#### 4.1.1 The File Menu

**File** → **New (Ctrl+N)** Creates a new KFormula document.

**File** → **Open... (Ctrl+O)** Opens a previously saved document.

**File** → **Open Recent** Displays a selection of recently opened documents.

**File** → **Save (Ctrl+S)** Saves the document.

**File** → **Save As...** Saves the document with a name you provide.

**File** → **Reload** Reloads the more recently opened document.

**File** → **Import** Imports formulas from other formats.

**File** → **Export** Exports the current document in another format.

**File** → **Mail...** Invokes KMail so you can email the file. The file is already attached to the email.

**File** → **Print... (Ctrl+P)** Prints the document.

**File** → **Print Preview...** Shows how the printed document will appear.

**File** → **Document Information** Provides a dialog box where you can enter your name, email address and a short description about the document.

**File** → **Close (Ctrl+W)** Closes the current document.

**File** → **Quit (Ctrl+Q)** Quits KFormula.

### 4.1.2 The Edit Menu

**Edit** → **Undo (Ctrl+Z)** Undoes an action. You can revert to the state that existed before your last change.

**Edit** → **Redo (Ctrl+Shift+Z)** Undoes an undo. Reverse the action of Undo. This will restore the change you originally made.

**Edit** → **Cut (Ctrl+X)** Cuts a highlighted piece of text from the KFormula screen.

**Edit** → **Copy (Ctrl+C)** Copies a highlighted piece of text from the KFormula screen.

**Edit** → **Paste (Ctrl+V)** Pastes the text you selected with Cut or Copy to the KFormula screen.

**Edit** → **Select All (Ctrl+A)** Highlights all the text in the KFormula screen for either Cut or Copy.

**Edit** → **Remove Enclosing Element (Ctrl+R)** Removes enclosing braces, brackets or absolute value bars. This action takes place on the braces just outside the cursor.

**Edit** → **Convert to Greek (Ctrl+G)** Converts a Latin character to a Greek symbol.

**Edit** → **Edit Formula String...** Brings up an editor where you can edit the existing formula.

See the [Advanced editing](#) section for details.

### 4.1.3 The Element Menu

**Element** → **Add** → **Add Root** Inserts the square root.

**Element** → **Add** → **Add Fraction** Inserts a fraction.

**Element** → **Add** → **Add Bracket** Inserts a pair of brackets, i.e. (). You can also just type ( to insert a pair of brackets.

**Element** → **Add** → **Add Integral** Inserts the integral sign.

**Element** → **Add** → **Add Sum** Inserts the summation sign. ( $\sigma$ ).

**Element** → **Add** → **Add Product** Inserts the product sign.

**Element** → **Add** → **Add Matrix...** Inserts a matrix. A dialog box pops up, with the default size being 3x3. You can specify the number of rows and columns in this box.

**Element** → **Add** → **Add 1x2 Matrix** Inserts a two rowed column vector.

**Element** → **Add** → **Add Overline** Inserts an overline in this box.

**Element** → **Add** → **Add Underline** Inserts an underline in this box.

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**Element** → **Add** → **Add Multiline** Inserts a new line each time you type Enter in the square.

**Element** → **Add** → **Add Upper Index (Ctrl+U)** Adds an upper index like so:

$$\sum_{i=1}^N a_i$$

**Element** → **Add** → **Add Lower Index (Ctrl+L)** Adds a lower index:

$$\sum_{i=1} a_i$$

### NOTE

See the [Definite Integrals and Indices](#) section for details about indices.

**Element** → **Add** → **Add Negative Thin Space** Inserts a small reduced space, here between the o and the e:  $oe$  .

**Element** → **Add** → **Add Thin Space** Inserts a small space.

**Element** → **Add** → **Add Medium Space** Inserts a space that is one and a half times wider.

**Element** → **Add** → **Add Thick Space** Inserts a double space.

**Element** → **Add** → **Add Quad Space** Inserts a quadruple wide space.

**Element** → **Matrix** → **Insert Column** Inserts a column in an existing matrix. The column is inserted where the cursor is at.

**Element** → **Matrix** → **Append Column** Appends a column to an existing matrix. The column is appended on the right.

**Element** → **Matrix** → **Remove Column** Removes a column from an existing matrix. Removal occurs where the cursor is positioned.

**Element** → **Matrix** → **Insert Row** Inserts a row in an existing matrix. The row is inserted where the cursor is at.

**Element** → **Matrix** → **Append Row** Appends a row to an existing matrix. The row is appended on the bottom.

**Element** → **Matrix** → **Remove Row** Removes a row from an existing matrix. Removal occurs where the cursor is positioned.

**Element** → **Size** Allows to set the size of the font (from 6 to 72).

**Element** → **Left Delimiter** Allows insertion of various delimiters i.e. (, {, and [.

**Element** → **Right Delimiter** Allows insertion of various delimiters i.e. ), }, and ].

**Element** → **Insert Symbol (Ctrl+I)** Inserts the symbol, selected in the symbol toolbar.

#### 4.1.4 The Settings Menu

Here you can choose how KFormula is configured. You can select the toolbars you want displayed or the type of fonts to be used.

**Settings** → **Toolbars** → **File (KFormula)** Toggles the toolbar that contains clickable icons for new, open and save files. Print and print preview are here also.

**Settings** → **Toolbars** → **Edit (KFormula)** Toggles the edit toolbar. Here are clickable icons for cut and paste as well as Undo and Redo.

**Settings** → **Toolbars** → **Add (KFormula)** This toolbar contains all the mathematical elements such as Sum, Integral, Exponent etc.

**Settings** → **Toolbars** → **Font (KFormula)** This toolbar contains the font settings (size, bold, italic, etc.).

**Settings** → **Toolbars** → **Symbol (KFormula)** This toggles the combo box that contains Del, the partial derivative symbol, limit arrows, boolean operators and other mathematical symbols.

**Settings** → **Toolbars** → **Matrix (KFormula)** This toggles the matrix toolbar. It contains clickable icons that pertain to matrix creation and editing.

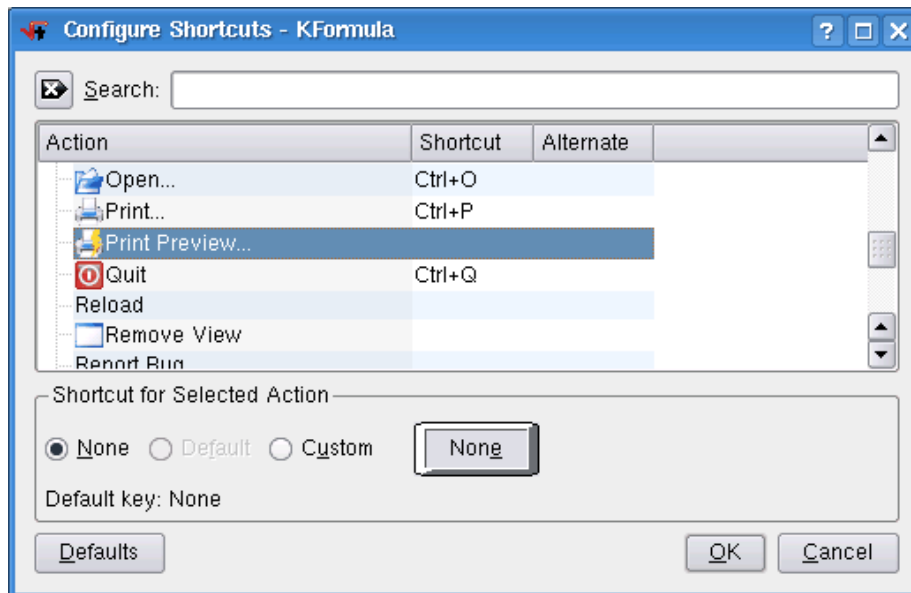
**Settings** → **Syntax Highlighting** Checking this item determines if the numbers will be displayed in color.

#### 4.1.5 Configuring Shortcuts

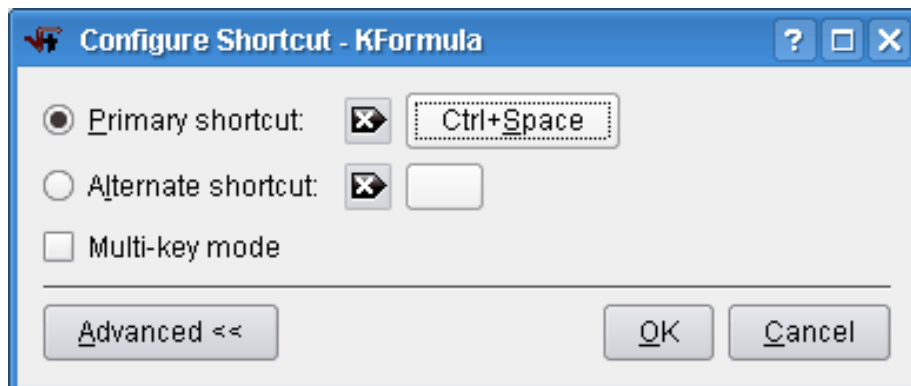
The Settings → Configure Shortcuts... allows you to specify shortcuts.

Below is an example of how to configure a shortcut for a print preview.

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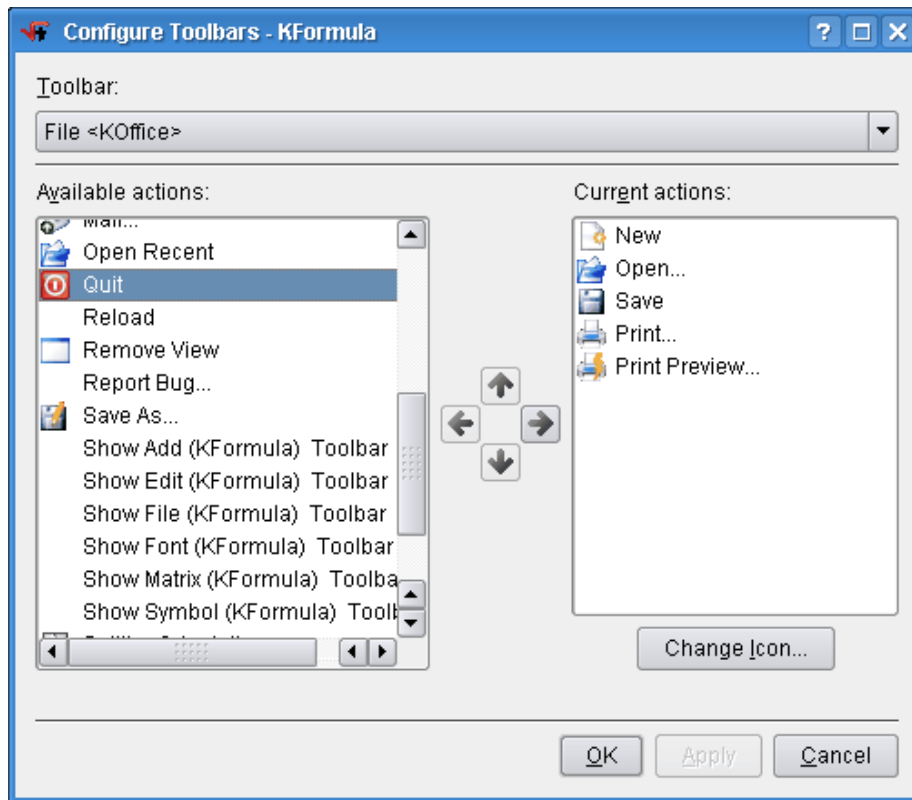
- Click on Custom.
- Next click on the button Advanced » and then Primary shortcut.
- Do **Ctrl** Space and the dialog should disappear. The shortcut is now entered.



Pressing the keys **Ctrl** Space now displays the print preview.

### 4.1.6 Configuring Toolbars

The Settings → Configure Toolbars... is used to add additional buttons to the toolbars.



- To add a button to the File toolbar,



make sure File <KOffice> is displayed in the top combo box.

- Click on one of the items in the left hand pane. This item will now be highlighted to show that it has been selected.
- Next click on the Right arrow button to place it in the right pane.
- Click on `Apply` and then click on `OK`.



The new Item should be in the toolbar.

#### 4.1.7 Configuring KFormula

The `Settings` → `Configure KFormula...` is where the font sizes and font styles are selected.

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- The Formula section allows you to select fonts and font highlight colors.

### 4.1.8 The Help Menu

**Help** → **Tip of the Day** Opens the Tip of the Day dialog which displays a random tip about KFormula.

**Help** → **KFormula Handbook (F1)** Invokes the KDE Help system starting at the KFormula help pages. (this document).

**Help** → **What's This? (Shift+F1)** Changes the mouse cursor to a combination arrow and question mark. Clicking on items within KFormula will open a help window (if one exists for the particular item) explaining the item's function.

**Help** → **Report Bug...** Opens the Bug report dialog where you can report a bug or request a 'wishlist' feature.

**Help** → **Switch Application Language...** Opens a dialog where you can edit the Primary language and Fallback language for this application.

**Help** → **About KFormula** This will display version and author information.

**Help** → **About KDE** This displays the KDE version and other basic information.

## Chapter 5

# Advanced Editing

### 5.1 Name insertion

A special feature is the name insertion. The blue square you type into is actual a list. Furthermore, that list can contain other lists. When you type a backslash (`\`) you get a new empty list right away. But this one is special. It uses a different font and is meant to insert things like function names. There is, however, a second idea here. Your keyboard only has a limited number of keys. The wealth of mathematical symbols on the other side is overwhelming. To get one of those you can type its name and press the space bar afterwards. The name you typed will be replaced by the symbol then. In this context, the **Space** bar means 'get out of here', that is move the cursor to the containing list. The cursor will be positioned at the end of what you just entered but will also enclose part of the original formula, after pressing the space bar.

Another thing you might want to insert are spaces. We all know, printing formulae is all about the right spacing. And you can do just that using a 'name list'.

Inside the blue square do: `\ , SPACE` to get a small space.

Do: `\ < Space` to get a medium space.

Do: `\ ; Space` to get a thick space.

Do: `\ quad Space` to get a quadruple wide space.

In the same way, specific mathematical symbols can be inserted. `\ oint Space` inserts the path integral about a closed contour. Below is the result of `\ oint Space`:



## 5.2 Editing Formulas

The Edit → Edit Formula String allows the user to edit the ASCII formulas that have been copied from other applications, such as [Scilab](#), and transform them directly into mathematical type. An example will make this clear. Below is a screenshot of INRIA Scilab.

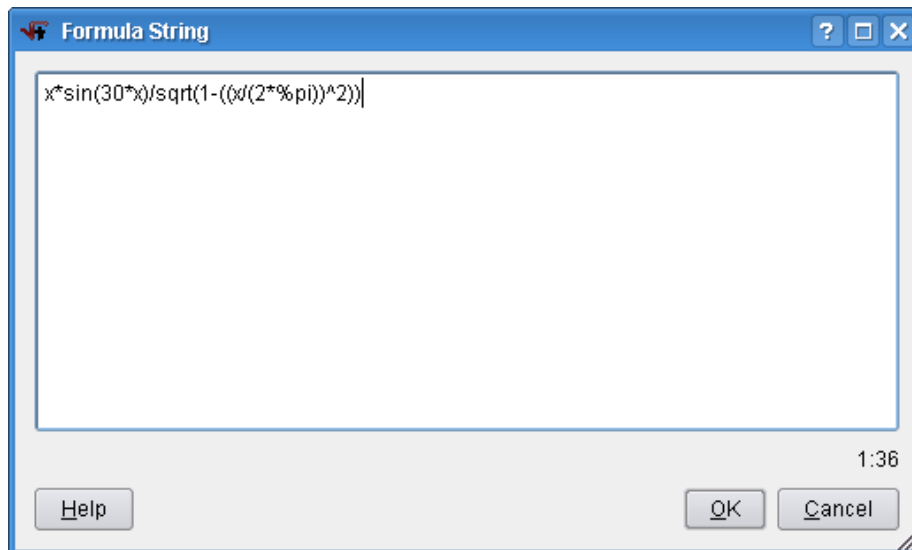
```

scilab-3.1.1
-----
          scilab-3.1.1
      Copyright (c) 1989-2005
    Consortium Scilab (INRIA, ENPC)
-----

Startup execution:
loading initial environment
-->deff('[y]=f(x)', 'y=x*sin(30*x)/sqrt(1-((x/(2*pi))^2))')
-->intg(0,2*pi, f)
ans =
- 2.5432596
-->
    
```

Copy and paste the text beginning with  $x \cdot \sin(30 \cdot x)$  into the formula editor as shown below:

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If you click on OK, the editor will complain about aborted parsing. It cannot recognize one of the symbols in the formula. The displayed formula would show that the Pi symbol is not correctly rendered. This means that the `%` must be deleted. Do this and KFormula will render the mathematical font properly, as shown below.

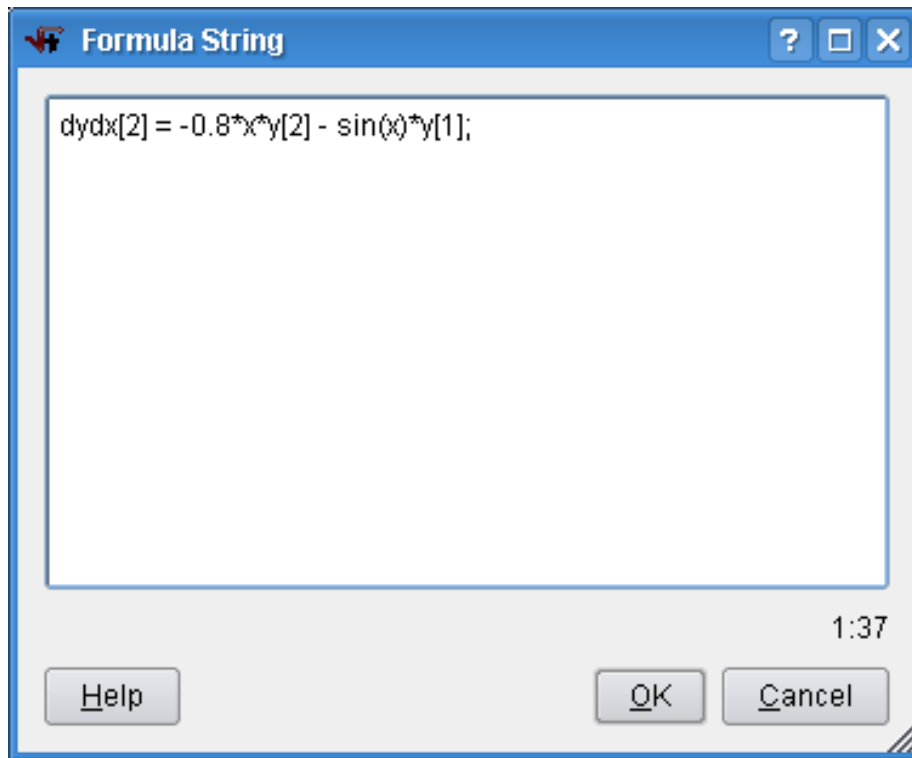
$$\frac{\sin(30 * x)}{\sqrt{1 - \left(\frac{x}{2 * \pi}\right)^2}}$$

The formula editor will accept most C language mathematical expressions, like the formulas from a Runge-Kutta program below:

```
void derives(float x, float y[], float dydx[])
{
    dydx[1] = y[2];
    dydx[2] = -0.8*x*y[2] - sin(x)*y[1];
}
```

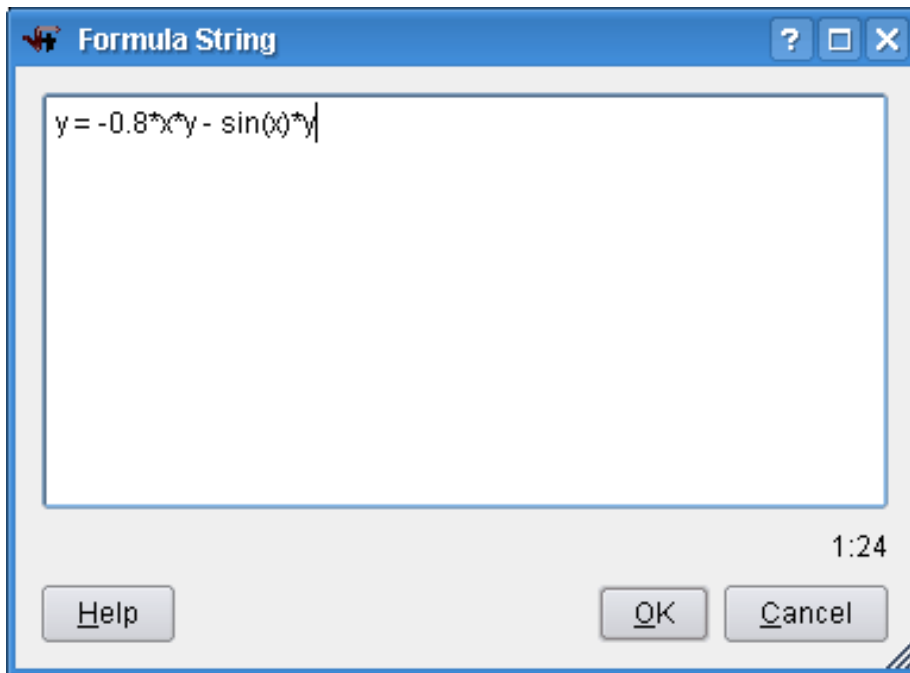
Here `dydx[1]` is the first order derivative and `dydx[2]` is the second order derivative. After copying the formula, you will have to edit the derivatives with KFormula. Here is how it is done. First copy and paste the bottom expression into the formula editor.

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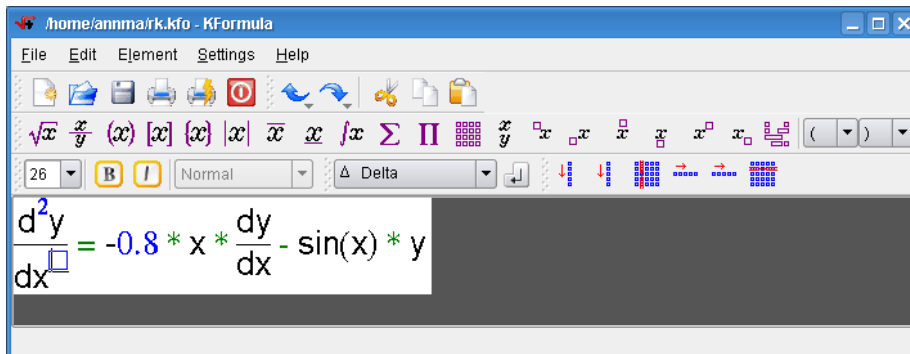


Next remove the [ ], leaving just y's.

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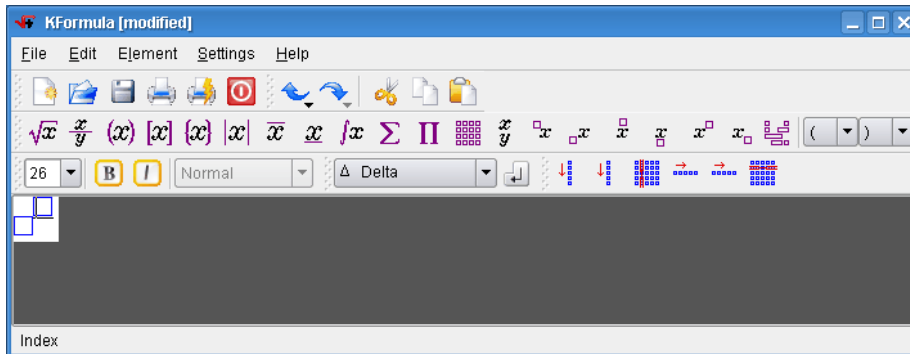


Now click OK and place the cursor by a  $y$  and delete it. Insert the appropriate symbols as shown below.



Not every expression that KFormula is capable of translates into a valid C expression. For example the superscript expression:

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is displayed as  $()^{**}()$ , which is not a valid C statement for exponentiation. Similarly the 1 by 2 matrix displays as  $() / ()$ . This is not a valid array in C.

### 5.3 Definite Integrals and Indices

#### 5.3.1 Definite Integrals

A definite integral is made by using Ctrl+U for the upper limit of integration and Ctrl+L for the lower limit of integration.

$$\int_0^{\pi} \sin(x) dx$$

Reposition the cursor in front of the integral after making the first of the limits.

#### 5.3.2 Positioning Indices

The upper or lower index can be positioned by highlighting the desired text. In this example, an arrow is needed above the P, in dP. Using Ctrl+U places the

desired vector symbol in the wrong place; namely above the 'd'.  $\overrightarrow{dP}$

The problem is solved by highlighting only the P in  $\boxed{dP}$  and then

entering Ctrl+U. Here is the correct result.  $d\overrightarrow{P}$

## Chapter 6

# Credits and Licenses

KFormula Copyright by The KFormula Team

KFORMULA DEVELOPERS (ALPHABETICALLY)

- Alfredo Beaumont Sainz [alfredo.beaumont@gmail.com](mailto:alfredo.beaumont@gmail.com)
- Ulrich Küttler
- Andrea Rizzi

Documentation copyright 2002 Jonathan Drews [j.e.drews@att.net](mailto:j.e.drews@att.net)

Documentation copyright 2005 Anne-Marie Mahfouf [annma@kde.org](mailto:annma@kde.org)

Documentation copyright 2006 Alfredo Beaumont Sainz [alfredo.beaumont@gmail.com](mailto:alfredo.beaumont@gmail.com)

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# Appendix A

## Installation

### A.1 How to obtain KFormula

KFormula is part of the KDE project <http://www.kde.org/> .

KFormula can be found in the koffice package on <ftp://ftp.kde.org/pub/kde/> , the main FTP site of the KDE project.

### A.2 Requirements

KFormula is part of KOffice on [The KFormula home page](#) You must have KOffice installed. KFormula will not work without the rest of KOffice

### A.3 Compilation and Installation

For detailed information on how to compile and install KDE applications see [Building KDE4 From Source](#)

Since KDE uses **cmake** you should have no trouble compiling it. Should you run into problems please report them to the KDE mailing lists.