

Falcon Math V0.1

COLLABORATORS

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Chapter 1

Falcon Math V0.1

1.1 Falcon Math V0.1

```

*****
*+-----+*
*|                |*
*|          FALCON MATH          |*
*|                |*
*+-----+*
*****

```

Welcome to FalconMath, the Algebraic formula manipulation package for the Amiga.

```

-----

Introduction      What Is FalconMath?
Requirements      What do I need to use it?
Instalation       How do I get it running?
Version
Equation Editor   The main part of the program
Other Tools       And the rest.
Tutorial          How do I ....?

Copyright         DISCLAIMER!!! *** READ THISBEFORE USE
Registration
Contacting FES
Thanks to...

```

1.2 Introduction

FalconMath is an algebraic manipulation package. It is aimed at people performing algebra at "A-Level" standard, or above.

It allows you to :-

- * Perform simple operations like Rearranging and multiplying-out brackets without fear of missing minus signs here and there.

- * Substitute in values for variables and evaluate expressions.
- * Produce Graphs of functions.
- * Layout expressions as simple reports.
- * Solve polynomial and linear-simultaneous equations.
- * Later versions will also performs integration,differentiation and trig-identities.

It is quite a large and complex program. This is not just a jumped-up calculator. This program performs actual algebraic manipulation. As a result of this it may take a while to become accustomed to it.

```
{ PS the word "Falcon" in the title of this program has nothing to do with  
  a computer made by a certain American manufacturer or with any other company  
  with ornathological nomenclature!}
```

1.3 Requirements

FalconMath requires the following minimum requirements:-

- * An Amiga
- * 1MB of memory
- * Version 2.04 or higher of the Operating System
- * MUI 2.0 (by Stefan Stuntz)

The only one of these requirements that may pose a problem is MUI. This is a User Interface System library it should be available from a similar source to this program.

1.4 MUI

This application uses

MUI - MagicUserInterface

(c) Copyright 1993 by Stefan Stuntz

MUI is a system to generate and maintain graphical user interfaces. With the aid of a preferences program, the user of an application has the ability to customize the outfit according to his personal taste.

MUI is distributed as shareware. To obtain a complete package containing

lots of examples and more information about registration please look for a file called "muiXXusr.lha" (XX means the latest version number) on your local bulletin boards or on public domain disks.

If you want to register directly, feel free to send

DM 20.- or US\$ 15.-

to

Stefan Stuntz
Eduard-Spranger-Straße 7
80935 München
GERMANY

1.5 instalation

Instaling FalconMath should be very straightforward - once MUI has been installed.

The installer script will copy the files automaticaly for you, or you can do it manually. The only files that need to be copied are the executable and this guide file. They should both be placed in the same directory.

1.6 version

This is version 0.5 of Falcon Math.

It is in no way, shape or form believed to be bug free.

There is still a lot of work to do on it. I am releasing it now as this is probably last chance I will get to access Aminet until September.

I would appreciate any comments/criticisms/feedback that you may generate.

Contacting Me

1.7 contact

Contact me in any of the following ways:-

Mail: =SDF=
14 Stretton Close
Mickleover
Derby

DE3 5NW
England

Email: EEE90067@ibm3090.bham.ac.uk } one of them
 MENG030@ee-alta.bham.ac.uk } should work...

I would be grateful for any feedback. (I like getting (e)mail :-)

1.8 copyright

This program is ©Copyright 1994 Falcon Enterprise Systems.

Rights are given to the general public to use and distribute versions up to V1.0 provided that no more than a reasonable fee for duplication is charged, and the whole package(including documentation) is distributed together and unmodified.

Permission is not granted to disassemble, decompile or in any way reverse-engineer or modify this package.

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IF YOU ARE NOT PREPARED TO ACCEPT THESE TERMS THEN YOU ARE NOT AAUTHORISED TO USE THIS PACKAGE!!!

1.9 registration

This current version is far too bug-ridden for me to try to make any claims. Version V1.0 will be a bug-fixed version of this program.

Versions after V1.0 FalconMath will be "CharityWare".

All features added after V1.0 will be disabled in distributed versions. To enable them you will need a special "key" obtainable only from FES.

To obtain a key you will need to send me PROOF that you have made a donation of at least £5 (or equivalent in other currency) to a recognised charity - preferably either a childrens charity such as the NCH or a cancer research charity such as Imperial Cancer Research.

To constitute proof I need a piece of paper with:-

- * The charity's letterhead or a sticker
 - * The charity's name.
-

- * Your name
- * A statement that at least £5 was recieved
- * A signature from a representative of the charity

Probably the easiest way of obtaining such a proof is to go into a charity shop, make a donation and ask for a receipt.

Alternatively you can make a donation directly to me. I can accept cash in UK Pounds or any other EC Currency (or US \$). I can also accept cheques drawn on UK banks (made payable to S.D.Forey). I CANNOT accept cheques drawn on non UK banks).

I will confess that money sent to me goes into my pocket not to any charity - I think I deserve something for writing this program.

Please make sure that you include your full name, address, telephone number and if possible email address. I will send keys out by email if possible, otherwise by mail. If possible include a stamped addressed envelope if you want me to reply by mail - stamps and envelopes cost me a fortune.

Please note this process only gets you a key. You will need to obtain the latest version of the software from your normal source. Alternatively you can send me a blank disk and a stamped addresses envelope I will supply you with the latest version. Overseas people - I can accept a second blank disk in place of a stamp.

1.10 Falcon Math V0.1

The main window is divided into three regions:-

+			+
	STATUS BAR		
+			+
+			+
	CURRENT EQUATION		
+			+
+			+
	$\langle \hat{O}_V \rangle$		

Otherside

$$1/x \iff x^{-1}$$

Multiply

Factorize | |

	Both Sides
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Substitute

Evaluate

Simplify

Group		
-------	--	--

| | Diff'ate


```

Integrate
  Trig
Algebra
New Expr    | |
            | |
            | | Store
Review      Undo      Help      | |
            | |
            | +-----+
            |
            +-----+

```

There is also a menu strip to access the more esoteric features.

1.11 Selection Gadgets

Normally to select terms in the CURRENT EQUATION you simply click on the term in question. However in some situations this is awkward.

These five small buttons provide an alternative way of selecting sections of the equation in the main window.

The central button selects the whole expression.

The Down arrow narrows the selection, Up broadens the selection.

Left and right cycle through all possible selections at this level.

These buttons have keyboard Shortcuts:-

```

Broaden Selection = 8
Narrow  Selection = 2
Cycle Left       = 4
Cycle Right      = 6
Select All       = 5

```

{ the shortcuts are based on the numeric keypad. }

1.12 Other Side

Button Description: Other Side Button

This moves a term to the other side of an equation.

For this to be possible there must be an equation (rather than an expression) in the window and the term must be transferable to the other side in a single operation.

For example

$$A + B * C = D$$

The A can be moved to the other side (to give $B \cdot C = D - A$), as can $B \cdot C$, but not B or C independantly.

1.13 To Both Sides

This function allows you to perform an operation on both sides of an equation.

After pressing the button a window will appear.

Select the operation to perform in the upper of the two cycle gadgets. This can be one of ADD, SUBTRACT, MULTIPLY, DIVIDE.

Then enter the argument in the string gadget at the top.

1.14 Current Expression

This window contains the expression that you are currently working on.

Parts of the expression that have been selected are shown in white, other parts are in black.

To select a part of the expression click on it with the mouse.

- * To select an individual variable or constant (eg "a" or "1") click on the symbol itself.
- * To select several terms multiplied together click on the space between them or click on one then on the Up Arrow Button.
- * To select the contents of a bracket click on the bracket
- * To select terms joined by an operator click on the operator (eg to select "a+b" click on the "+")

1.15 Entering a new expression

This button allows you to enter a new expression, or replace parts of an old one.

To start off it is the only enabled button.

When pressed a requester will appear allowing you to enter a new expression.

Expressions are entered in fairly normal algebraic notation, but note

- * Multiplication is denoted by ``*'`, division by ``/'`, exponentiation by `^^`
 - * Multi letter variable names ARE allowed. Although they are entered all on one level they will be displayed as subscripts in the expression window.
-

* The '*' for multiplication can be missed out when no confusion would arise for example:-

OK: 2a
 (a+b) (a-b)
 2a(6c-3)

NOT OK: 2ab means 2 times a_subscript_b
 2a/b*c means (2 times a divided by b) all times c

- * Brackets can be () or {}. The computer will automatically add/remove () brackets when appropriate. The computer will not remove {} brackets (exception - .
- * Functions are allowed, brackets are only needed where confusion could arise. A function name must be followed by an open bracket or a space.

1.16 Functions

FalconMath understands the following functions:-

```
sin          }
cos          } All
tan          } arguments
arcsin       } in
arccos       } radians.
arctan       }
ln           <== log to base e
exp
log          log to the base 10.
```

Function names must be followed by a space or an open bracket.

1.17 1/x to x⁻¹

This function switches between alternate ways of writing the same thing.

So for example 1/x can be written as x-¹.

This function can also be used to change a whole expression.

So a-c = b-d

will be converted to c-a = d-b

1.18 Multiply Out

This is used to multiply out a bracket.

It can be used on terms of the form (...)(...) and also on (...)^n

For large expressions this function can take some time - and produce very long expressions. (try $(a+b)^9$)

1.19 bt_factoriz

This is used to remove common factors from a series of terms.

For example to convert $a*b + a*c$ into $a(b+c)$

It can also be used on polynomial expressions where the coefficients are constants. Eg x^2+3x+2 can be converted to $(x+1)(x+2)$

1.20 Substitute

This allows you to replace all occurrences of an expression with another expression. Select the term to replace and click on Substitute. The requester that appears allows you to enter a new expression from the keyboard or to retrieve one from the storyboard.

While this CAN be used to replace expressions they must be of EXACTLY the same form as the original. If you substitute 'u' for 'x+1' don't expect the program to replace 'x' with 'u-1'. To perform this form of substitution you should replace 'x' with 'u-1' then call SIMPLIFY to remove any excess constants.

1.21 Evaluate

This can be used to evaluate the expression currently in the window.

It does NOT work on equations (ie if there is an equals sign in the expression then this function will always return zero).

The program will need to know what values to substitute in for any variables used in the expression. When you have entered these then press "EVALUATE" and the expression will be calculated.

There is also the option to graph the function. The graph works on the same values for variables as the evaluator.

1.22 Simplify

This button attempts to remove any redundant parts in the main window. Things such as 'a-a' will be replaced with zero, 'a*a' with a^2 and so on.

It is best to press this button occasionally during work as it removes

any little inefficiencies that may have built up.

Simplify can also be used to remove a pair of "squigely" {} brackets. Click on the bracket then press SIMPLIFY. Squigly brackets are unlike round () brackets in that the computer will not normally remove them when they are redundant. This allows you too group terms together.

1.23 Group

This is used to collect together terms.

This may be for clarity or it may be that you want to perform an operation on some terms but not others.

Select the narrowest group of terms wider than the group you want to collect then press the GROUP button. A requester will appear to allow you to select which terms to group. The group can be undone by selecting the group and pressing SIMPLIFY.

1.24 Differentiate

This will be used to differentiate an expression.

Currently it is not yet implemented.

1.25 Integrate

This will be used to integrate an expression.

Currently it is not yet implemented.

1.26 Algebraic Identities

This button is used to apply an algebraic manipulation to an expression - for example partial fraction expansion or completing a square.

Currently no manipulations have been implemented.

1.27 Trigonometric Identities

This button is used to apply a trig identity to a term.

Currently implemented trig identities are:-

$$\sin(a+b) \rightarrow \sin a \cos b + \sin b \cos a$$

```

cos (a+b)  -->  sin a sin b - cos a cos b
sin (n*a)  -->  sin ( (n-1)a + a)          n=+ve int
cos (n*a)  -->  cos ( (n-1)a + a)          n=+ve int

```

More identities will be implemented in the near future.

1.28 graph

This allows an expression to be graphed.

To access the graph select evaluate and specify the values to use for any constant variables.

Then select GRAPH. A new requester will appear to allow you to specify the ranges of the X and Y axis, and a choice of which variable to use on the X axis.

Press OK and the graph will be drawn. Use the menus on the graph screen to return to the main program.

1.29 storyboard

FalconMath allows you to collect together a number of equations, number them, and link them with explanatory text. This resultant "storyboard" can then be saved to disk, printed as a report, saved as an IFF graphic (soon) or used as a store for equations under development.

The expression in the main window can be pasted into the storyboard by pressing the store button on the bottom row of the main window.

The storyboard can be viewed and old expressions brought back for further editing by means of the RETRIEVE button. This will display the storyboard. Double Click on an expression to transfer it to the main window.

The menu bar also has commands to manipulate the storyboard.

```

Edit   *** not yet implemented
View   *** only partialy implemented

```

1.30 sb_store

This button places the current expression onto the storyboard.

Pressing it brings up a requester. This allows you to specify how the equation will be represented on a printed report.

"Preamble" is a section of text that will be written before the equation

"Equation" is the equation in text form.

"ID" is a short message that will be displayed to the right of the equation - useful for numbering equations.

"C Normal" Allows you to determine the type of box that will be drawn around the equation.

"Postamble" Is a section of text that will be printed after the equation.
