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 Rearanging 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 accostomed 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 availible 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 straighforward – once MUI has been
installed.

The installer script will copy the files automaticaly for you, or
you can do it manualy. 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.

Commercial Distribution of this product (including magazine coverdisks)
is prohibited.

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 statment 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 recipt.

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 somehing 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
                                      | |
    | |                                                             | |
    | +-----------------------------------------------------------+ |
    |                                                               |
    | +-----------------------------------------------------------+ |
    | |                                                             | |
    | |
              < ^ O v >
              Otherside
              1/x <=> x-$^1$
              Multiply
              Factorize
               | |
    | |
              Both Sides
              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

              Normaly 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*C=D-A), as can B*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 arrise
  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 automaticaly add/remove () brackets when appropriate.
  The computer will not remove {} brackets (exception − .

*
                Functions
                 are allowed, brackets are only needed where confusion could
  arrise. 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 coeficients
are constants. Eg   x^2+3x+2 can be converted to (x+1)(x+2)

1.20   Substitute

              This allows you to replace all occurances 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 origional. 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 occasionaly during work as it removes
any little ineficiencies 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 normaly 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 unmade 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)  -->   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 wil 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.