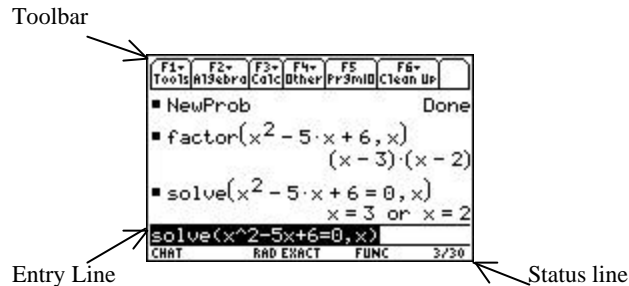


# Features of the TI-89 that Maximize its Use Folders, Files, and Management techniques

Martha Green, Baldwin High School

[magreen@juno.com](mailto:magreen@juno.com)

## The TI89 Home Screen



## MISCELLANEOUS INFORMATION

- ◆ "Disintegrated" print *does not* indicate a fault in the calculator
- ◆ Implied multiplication  
The 89 recognizes two letter variables, therefore "*a times b*" must be entered as "*a\*b*" to distinguish it from the variable *ab*.
- ◆ Each application has its own function key assignments with pull-down menus
- ◆ Begin new work by "erasing the board" with 2: NewProb(lem)  
This clears previously assigned single-character variable names (unless locked or archived); turns off functions and/or stat plots (in graph mode).
- ◆ Use ∞ON (instead of 2ON) to turn calculator off. It then opens in window last used.

## SPECIAL KEYS

- ∞ (green) shortcut key to graph features  
≈, inverse trig,  $e^x$ , ∞, *del*  
changes contrast  
cut, copy, paste
- 2 (yellow) access to keys, custom, character, math, memory menus  
<=>]T and others
- φ (purple) used to type in text  
/ capitalizes  
2φ - locks TI into text type

- | An alphabetic list of all functions and commands  
Indicates syntax needed (on the Status line)



5) enter ↵

## MANAGEMENT TECHNIQUES

Data can be stored in the '89 in folders created specific to classes, workshop, etc.

Folders are listed alphabetically The files in each folder are also in alphabetical order.

### CREATE A FOLDER

2°



5:Create Folder

type in name of new folder ↵ ↵



Programs and functions must either be used in the folder where they reside or called up using the proper path: *name of folder\name of program or function*.

*Hint:* Create a folder "A" to house frequently used programs and functions. From entry line in ∇ screen you can use ° to retrieve what you need.

Functions and programs can be moved from one folder to another using ° .

place cursor over function to be moved

4:

choose destination folder



### Other Management features

Archive

- creates additional free RAM
- stores data, etc. in a safe location
- stores equations for use in Numeric Solver
- protects variable from inadvertent deletion of data

Lock

Deletes

- removes unwanted text, variables, files *caution: there is no "undo", what is deleted STAYS deleted!*

## The TI 89 script feature

The feature saves work done in the home screen, which can be accessed later.

Graph the piecewise function  $f(x) = \begin{cases} x^2 & x < 0 \\ 4\sqrt{x} & 0 \leq x \leq 4 \\ 12 - x & x > 4 \end{cases}$  and save as a script

In home screen

2:NewProb(1em)

1:Define f(x)=when(x≤4,when(x<0,x^2,4x^(1/2)),12-x)

1:Define xmin=-6

1:Define xmax=14

1:Define ymin=-6

1:Define ymax=16

2:Graph f(x)

2: Save copy As ↵



Name the work in variable box



To Retrieve the script



APPS 8 ↵

TO RUN SCRIPT

Locate cursor on first line.

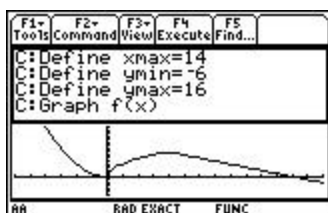
executes each command



Select folder & file ↵ ↵



View splits screen



## Differential Equations

... **C:** deSolve returns an equation that explicitly or implicitly specifies a general solution to a 1<sup>st</sup> or 2<sup>nd</sup>-order ordinary differential equation.

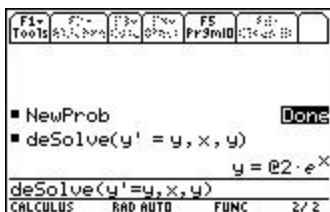
$y'$  and  $y''$  are used to denote the first and second derivatives of the dependent variable with respect to the independent variable.

' is entered by pressing 2=

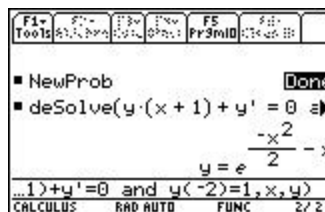
The general solution will contain an arbitrary constant of the form @k The  $k$  is random and resets whenever 8:ClrHome is utilized. Because of the various methods used to solve DEs, the answer obtained may be a different general solution than anticipated.

**General solution Syntax:** deSolve(*the differential equation*,x,y)

**Initial Condition Syntax:** deSolve(*the differential equation and initial conditions*,x,y)



Example: Find the general solution to  $y' = y$ .



Find the particular solution of the differential equation  $y(x+1) + y' = 0$  if  $y(-2) = 1$ .

deSolve(y\*(x+1)+y'=0 and y(-2)=1,x,y)

### Free Response question AB & BC 6 1997 \*

Let  $v(t)$  be the velocity, in ft/sec, of a skydiver at time  $t$  sec.,  $t \geq 0$ . After her parachute opens, her velocity satisfies the differential equation  $\frac{dy}{dt} = -2v - 32$  with initial condition  $v(0) = -50$ .

- Find an expression for  $v$  in terms of  $t$ , where  $t$  is measured in seconds.
- Terminal velocity is defined as  $\lim_{t \rightarrow \infty} v(t)$ . Find the terminal velocity of the skydiver to the nearest foot per second.
- It is safe to land when her speed is 20 ft/sec. At what time  $t$  does she reach this speed?

deSolve(v'=-2v-32 and v(0)=-50,x,v)  $\downarrow$  .....  $v = -34e^{-2x} - 16$

limit(v = -34e<sup>-2x</sup> - 16,x,  $\infty$ )  $\downarrow$  .....  $v = -16$  (ft/sec)

solve(-20=-34e<sup>-2x</sup> - 16,x)  $\downarrow$  .....  $x = \frac{\ln(17/2)}{2}$

$\infty \div$  ..... 1.070 (sec.)

\*AP Free Response Questions are the property of the College Board and may be used for face to face instruction only

## DIFFERENTIAL EQUATIONS AND SLOPE FIELDS

Set to DIFF EQUATIONS in 3.

Turn off all functions and data plots (in y = window )

Set graph format  $\infty \subseteq$  to SLPFLD

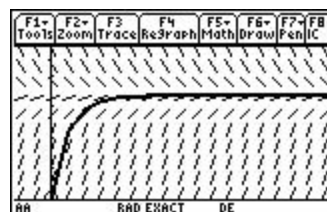
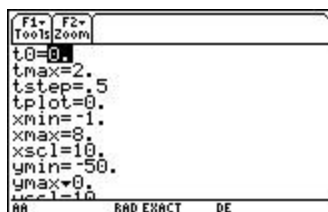
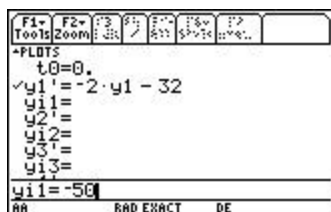
Define the viewing window

Enter differential equation in y1'

Enter initial condition in y11 (optional)

Graph (without an initial condition the slope field alone is graphed)

Example One: Free Response question AB 6 1997  $\frac{dy}{dx} = -2y - 32, y(0) = -50.$

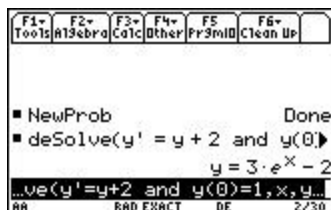


Example two

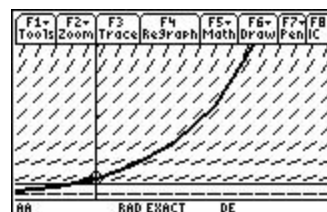
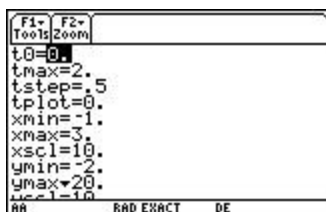
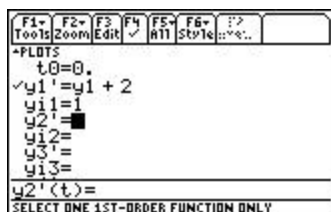
Solve the initial condition problem  $\frac{dy}{dx} = y + 2$  and  $y(0) = 1$

In home screen

deSolve(y'=y+2 and y(0)=1,x,y).....y=3e<sup>x</sup> - 2



Graphically



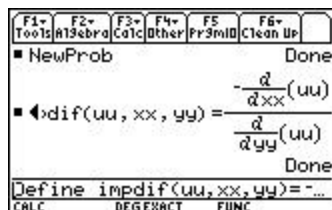
## CREATING A USER-DEFINED FUNCTION

User-defined functions can extend the capabilities of the TI.

Especially useful is one that will do implicit differentiation (credit given to John Hanna)

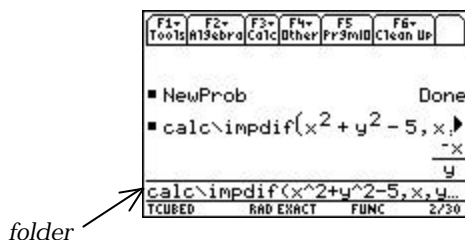
A) In the home screen define the function *impdif*

1: define impdif(uu,xx,yy)=-d(uu,xx)/d(uu,yy) ↵



EXAMPLE: Find deriv of  $x^2 + y^2 = 5$        $\text{impdif}(x^2+y^2-5,x,y) \rightarrow \dots\dots\dots \frac{-x}{y}$

If you are in a different folder when you wish to use a function it must be accessed through the proper path name. The most efficient method is to retrieve a function (or program) through 2VAR-LINK.

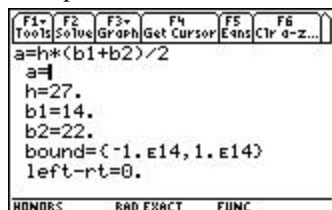


The **Numeric Solver** can solve any multi-variable equation with one unknown

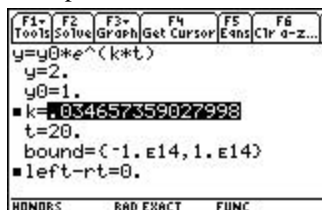
Example one: What is the height of a trapezoid with bases of measures 14 and 22, given that the area is 486 square units.

- O9:
- type in equation ↵
  - enter values for each variable, (except unknown)
  - move cursor to unknown variable
  - press F2 [Solve]

example one



example two



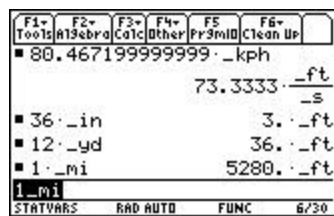
Example 2: The population of a country increases at a rate proportional to the existing population. If the population doubles in 20 years, what is the factor of proportionality ("k")?

## UNITS

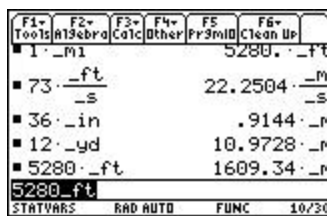
In both Physics and Chemistry classes correct unit conversion is a necessary procedure. The 89 can do these computations. Should you have the need, specific user-defined units can be created (page 76 TI-89 guide book) The units menu is accessed by selecting 2 3.



When 3 is set for SI (metric system) the calculator automatically converts length units (whether feet, inches or kilometers etc) into meters. If 3 changed to ENG/US it converts length units into feet.



3 set to ENG/US



3 set to SI

As with all other functions, the symbols and units can be typed directly on the entry line instead of going through the units menu (you just have to know the correct abbreviation for each unit). The underscore \_ is obtained by pressing the green  $\infty$  3 and the conversion operator | by pressing 23.

Example: Change 50 miles/hour to the equivalent km/hour

keystrokes: 50\_mph|\_kmh ↵.....80.4672\_kph

## TEMPERATURE CONVERSIONS

| Syntax: **tmpCnv**(expression, \_ 1<sup>st</sup> temp unit, \_ 2<sup>nd</sup> temp unit)

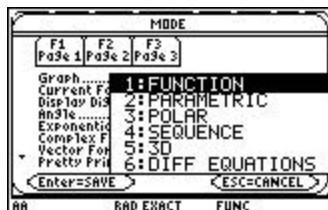
| is accessed by 2 (the "with" operator)



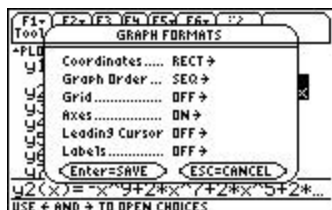


## GRAPHING TECHNIQUES

The TI 89 can graph functions, parametric, polar, and differential equations. It also can graph sequences and in three dimensions. 3 page one accesses the various types of graphs.



### Graph Format



9 or  $\infty$  accessed from the y = or the graph screen



accessed from y = screen

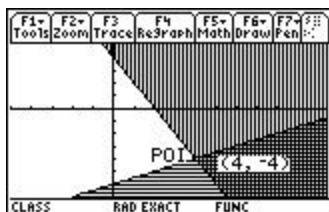
### FUNCTION GRAPHING 31:FUNCTION

Systems of equations

$$y \geq -2x + 4 \quad \text{style 7: Above}$$

$$y \leq \frac{1}{2}x - 6 \quad \text{style 8: Below}$$

Text added using Pen 7:Text



### Quick Center

If function traced off the top or bottom of the screen, press  $\div$  to center viewing window on the cursor location

### Shading Math C

between two functions

between a function and the x-axis

### Finding the distance between two points 9: Distance

Measure the horizontal distance between two consecutive peaks of the sine curve.

### Graphing a Family of curves

Enter a list in the expression.  $y1 = \{1, 2, 3, 5, 10\}x^2$

$$y2 = \{1, .75, .5, .25, .1\}x^2 \quad (\text{change style to Dot})$$

### Collecting Data Points

1. Display the graph
2. Display coordinates to collect
3. Press  $\infty \bullet$  - puts data in Home screen history area  
-or-  
 $\infty \beta$  - stores coordinates in a data variable named sysData

### Drawing a line based on a Point and a slope

(From Graph screen) 6:DrawSlp  
switches to Home screen and puts **DrawSlp** in entry line.  
Syntax:  $x,y,slope \leftarrow$

### Animating a Series of Graph Pictures

#### **CyclePic** command

Uses a series of graph pictures that have the same base name and are sequentially numbered starting with 1 (pic1, pic2, pic2,...)

Syntax **CyclePic**picNameString, n [,wait] [,cycles] [,direction]

## **LINKING**

Programs, functions can be send and received from another TI-89 or TI-92 .

### HOW TO: Connect units by cable to the I/O ports

Open 2<sup>o</sup> screen on both calculators

Receiving Unit

Link 2: Receive

WAITING TO RECEIVE and the BUSY indicator will be displayed in status line.

Sending Unit

Select variables to be sent using

Link 1: Send to TI-89/92 Plus -or- 3: Send to TI-92

## **UPGRADING TO A NEWER VERSION**

All memory is cleared on the receiving calculator when upgrading.

The product code updates the calculator and allows for Flash Applications to be received.



A:About - indicates current software version and serial number of your unit