

TI-89 Titanium and Voyage™ 200
Advanced Mathematics
Software version 3.10

August 2005

New Features

- **Domain Improvements**
- **Graphing Improvements**
- **Logarithm Functions**
- **Root Function**
- **Increased Solving Capabilities**
- **Gradian Angle Measure**
- **Population Standard Deviation**
- **Implicit Derivatives**

Domain Improvements

A Warning is displayed:

- when the intermediate steps in a computation involved complex numbers, and
- when the domain may have changed.

The image shows a TI-89 calculator screen displaying the derivation of the quadratic formula. The screen is divided into several sections. At the top, there are function keys: F1 (left arrow), F2 (Algebra), F3 (Calc), F4 (Other), F5 (PrgmIO), and F6 (Clean Up). Below the keys, the quadratic formula is shown in three steps:

$$\begin{aligned} & \left[2 \cdot a \cdot x + b = \sqrt{b^2 - 4 \cdot a \cdot c} \right] - b \\ & 2 \cdot a \cdot x = \sqrt{b^2 - 4 \cdot a \cdot c} - b \\ & \frac{2 \cdot a \cdot x = \sqrt{b^2 - 4 \cdot a \cdot c} - b}{2 \cdot a} \end{aligned}$$

The final result is shown as:

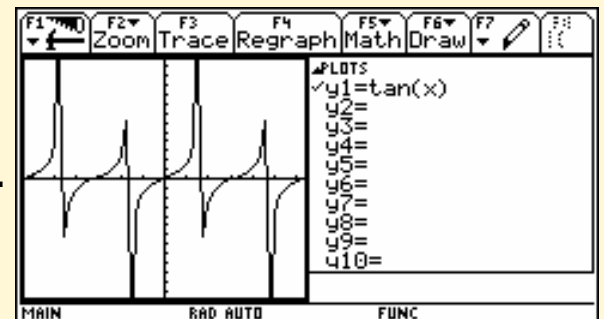
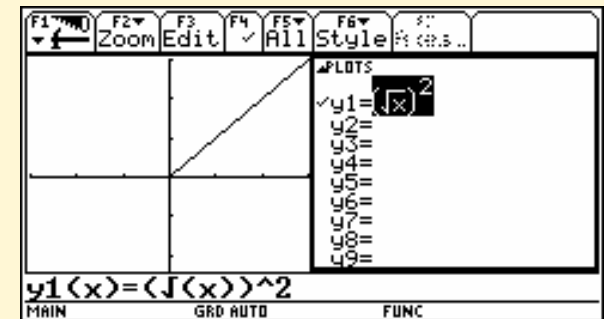
$$x = \frac{\sqrt{b^2 - 4 \cdot a \cdot c} - b}{2 \cdot a}$$

Below the equations, the text "ans(1)/(2a)" is displayed. At the bottom of the screen, a warning message reads: "Note: Domain of Result may be larger".

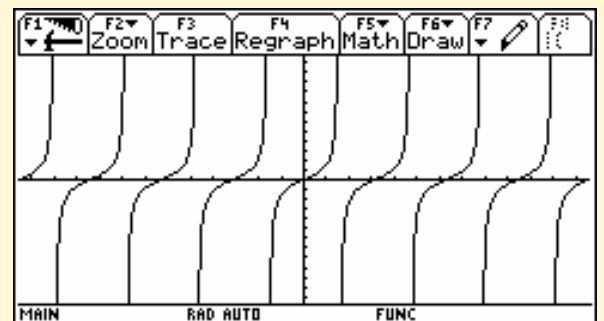
Graphing Improvements

- No auto-simplification when graphing. Points are not plotted when complex intermediate results occur.
- Discontinuity Detection provides the option to remove “faux” asymptotes by introducing a smart discontinuity detection mechanism.
- Graphing piecewise defined functions is improved as well!

Before...

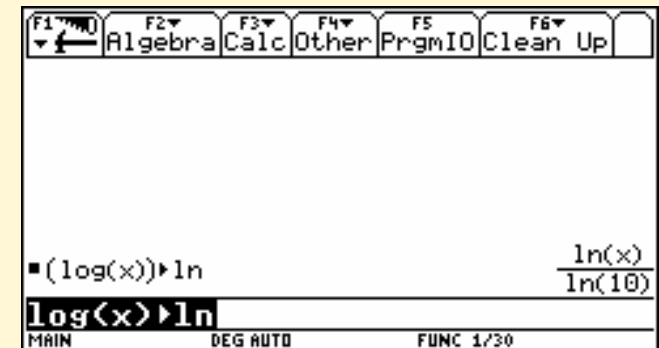
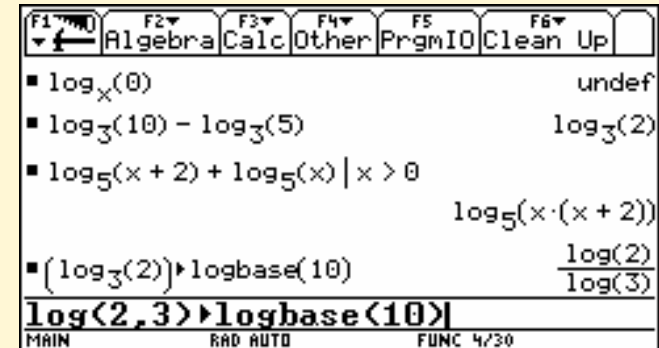


After...



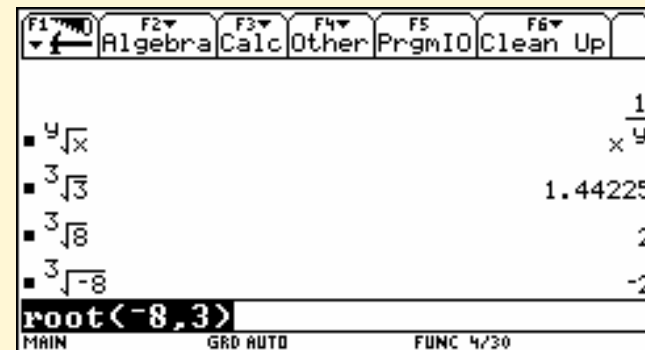
Logarithm Functions

- Keyboard access to log function: \blacklozenge $\boxed{7}$
- Support for log to any base including transfinite bases and algebraic expressions.
- Commands for natural log and any log conversion.
- Displays subscripts.



Root Function

- Keyboard access to root function: \diamond $\boxed{9}$



Increased Solving Capabilities

- Solves inequalities involving polynomial, rational, and absolute value expressions.
- Solves fundamental problems involving vectors, including decomposition and intersection problems (two lines, a line and a plane, two planes) involving parametric forms.

```

F1  F2  F3  F4  F5  F6
┌───┬───┬───┬───┬───┬───┐
│ Algebra Calc Other PrgmIO Clean Up │
├───┴───┴───┴───┴───┴───┤
│ solve(x^2 > 1, x)           x < -1 or x > 1
│ solve(1/x^2 > 1, x)       x ≠ 0 and -1 < x < 1
│ solve(x^2 > -1, x)         true
├───┴───┴───┴───┴───┴───┤
│ MAIN          RAD AUTO          FUNC 4/30
└───┬───┬───┬───┬───┬───┘

```

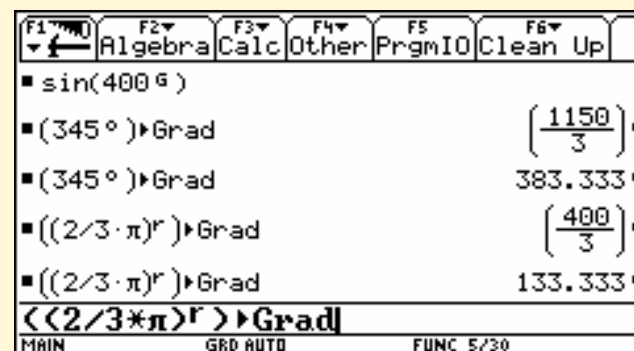
```

F1  F2  F3  F4  F5  F6
┌───┬───┬───┬───┬───┬───┐
│ Algebra Calc Other PrgmIO Clean Up │
├───┴───┴───┴───┴───┴───┤
│ [-6 0 1] → d                [-6 0 1]
│ [4 0 2] → a                  [4 0 2]
│ [-1 2 1] → b                 [-1 2 1]
│ [7 6 5] → c                  [7 6 5]
│ solve(x·a+y·b+z·c=d, {x y z})
│                             x = 11/6 and y = 4 and z = -4/3
│ solve(x*a+y*b+z*c=d, {x,y,z})
├───┴───┴───┴───┴───┴───┤
│ MAIN          RAD AUTO          FUNC 5/30
└───┬───┬───┬───┬───┬───┘

```

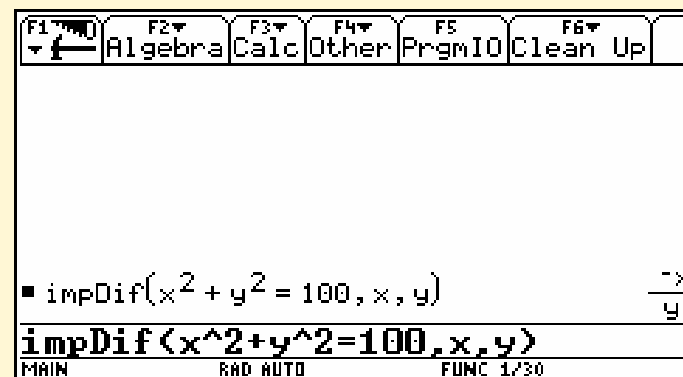
Gradian Angle Measure

- New Gradian angle mode, indicated by GRD on the status line.
- ► GRAD for angle conversion
- Superscript G indicates the new angle measure.



Implicit Derivatives

- Compute implicit derivatives for equations in two variables in which one variable is defined implicitly in terms of another.
- Calculus menu: Press $\boxed{F3}$ D



Population Standard Deviation

stDevPop(*list* [, *freqlist*]) \Rightarrow *expression*
returns the population standard deviation of the elements in *list* when *list* has at least two elements.

