# TI-89 Graphing Calculator FOR DUMMIES®

by C. C. Edwards


Wiley Publishing, Inc.

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FOR

# DUMMIES®

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# About the Author

**C. C. Edwards** has a Ph.D. in mathematics from the University of Wisconsin, Milwaukee, and is currently teaching mathematics on the undergraduate and graduate levels. She has been using technology in the classroom since before Texas Instruments came out with its first graphing calculator, and she frequently gives workshops at national and international conferences on using technology in the classroom. She is the author of *TI-83 Plus Graphing Calculator for Dummies* and *TI-84 Plus Graphing Calculator for Dummies* and she has written 40 activities for the Texas Instruments Explorations Web site. She was an editor of *Eightysomething!,* a newsletter that used to be published by Texas Instruments. She still hasn't forgiven TI for canceling that newsletter.

Just barely five feet tall, CC, as her friends call her, has three goals in life: to be six inches taller, to have naturally curly hair, and to be independently wealthy. As yet, she is nowhere close to meeting any of these goals. When she retires, she plans to become an old-lady carpenter.

# Dedication

This book is dedicated to Julia Hamp Edwards, my grandmother. She was a very wise and loving person who saw to it that I got to go to college.

# Author's Acknowledgments

I'd like to thank the folks at John Wiley & Sons who worked behind the scenes on the creation of this book. I don't come in contact with many of these people until the book is in the editing stage, which takes place after I write the acknowledgments. But from past experience I know that they do an extremely good job. Unfortunately, I can't tell you about it at this time. Their names appear in the Publisher's Acknowledgments.

The Wiley people I've been dealing with so far are the same people I worked with on the *TI-83 Plus Graphing Calculator For Dummies* and *TI-84 Plus Graphing Calculator For Dummies* books: Melody Layne, acquisitions editor, and Christopher Morris, project editor. As usual, Melody has given me many superb ideas for the book and has been a great liaison with Texas Instruments. And Chris, as before, has given me extremely good criticism. It's hard to disagree with Chris because he's usually right on target.

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We're proud of this book; please send us your comments through our online registration form located at www.dummies.com/register/.

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# Contents at a Glance

# Table of Contents

# Introduction

Do you know how to use the TI-89, TI-89 Titanium, TI-92 Plus, or Voyage 200 graphing calculator to do each of the following?

- Solve equations and systems of equations
- Factor polynomials
- Evaluate derivatives and integrals
- Graph functions, parametric equations, polar equations, and sequences
- Create Stat Plots and analyze statistical data
- Multiply matrices
- Solve differential equations and systems of differential equations
- Transfer files between two or more calculators
- Save calculator files on your computer
- Add applications to your calculator so it can do even more than it could when you bought it

If not, this is the book for you. Contained within these pages are straightforward, easy-to-follow directions that tell you how to do everything listed here — and much, much more.

## About This Book

Although this book doesn't tell you how to do *everything* the calculator is capable of doing, it gets pretty close. It covers more than just the basics of using the calculator, paying special attention to warning you of the problems you could encounter if you knew only the basics of using the calculator.

This is a reference book. It's process-driven, not application-driven. I don't give you a problem to solve and then tell you how to use the calculator to solve that particular problem. Instead, I give you the steps you need to get the calculator to perform a particular task, such as constructing a histogram.

# Using This Book with a TI-92 Plus or a Voyage 200

Although this book isn't expressly written for the TI-92 Plus and Voyage 200, it does tell you how to use these calculators, but you must keep in mind three minor differences between these calculators and the TI-89:

- The TI-92 Plus and Voyage 200 have QWERTY keyboards, the TI-89 doesn't. So when I give directions telling you to press ALPHA to enter a letter on the TI-89, on a TI-92 Plus or Voyage 200 you'd simply press the letter on the QWERTY keyboard.
- There are some symbols on the TI-89 keypad that are located in different places on the TI-92 Plus and Voyage 200 keypads. But this is no big deal the Cheat Sheet that comes with this book lists these symbols and their locations on the TI-92 Plus and Voyage 200. Just refer to the Cheat Sheet when, for example, I tell you to press ◆^ to enter θ and you notice that θ isn't above the ^ key on the TI-92 Plus and Voyage 200.
- The TI-89 has only five Function keys on the keypad just below the calculator's screen, F1 through F5; the TI-92 and Voyage 200 have eight Function keys on the keypad below this screen. On the TI-89 you, for example, access function F6 by pressing 2nd F1, on the TI-92 and Voyage 200 you access this function by pressing the F6 key. So in this book when you see directions telling you to press 2nd F1, 2nd F2, or 2nd F3 you should respectively press the F6, F7, or F8 key on a TI-92 or Voyage 200 calculator.

# Conventions Used in This Book

When I refer to "the calculator," I am referring to the TI-89 and the TI-89 Titanium. With three minor differences, the instructions I give for "the calculator" can also be used on a TI-92 or Voyage 200. I explain these differences in the preceding section.

When I want you to press a key on the calculator, I use an icon for that key. For example, if I want you to press the ENTER key, I say "Press ENTER." If I want you to press a series of keys, such as the MODE key and then the Right Arrow key, I say, "Press MODE ▶." You press all keys on the calculator one at a time. On the calculator, there is no such thing as holding down one key while you press another key.

Becoming handy with the location of the keys on the calculator is tricky enough, but remembering the locations of the secondary functions (the color-coded functions above most keys) is even more of a challenge. So when I want you to access one of those functions, I give you the actual keystrokes. For example, if I want you to access the MATH menu, I tell you to press 2nd 5. This is a simpler method than that of the manual that came with your calculator it would say, "Press 2nd [MATH]," and then make you hunt for the location of the secondary function MATH. The same principle holds for using key combinations to enter specific characters; for example, I tell you to press ALPHA 0 to enter the less-than symbol.

When I want you to use the Arrow keys, but not in any specific order, I say, "Press ◀▶▲▼." If I want you to use only the Up and Down Arrow keys, I say, "Press ▲▼."

# What You Don't Have to Read

Of course, you don't have to read anything you don't want to. The only items in this book that you really don't need to read are the items next to Technical Stuff icons. These items are designed for the curious reader who wants to know, but doesn't really need to know, why something happens.

Other items that you might not need to read are the paragraphs that follow the steps in a procedure. These paragraphs give you extra help in case you need it. The steps themselves are in **bold**; the explanatory paragraphs are in a normal font.

# Foolish Assumptions

My nonfoolish assumption is that you know (in effect) nothing about using the calculator, or you wouldn't be reading this book. My foolish assumptions are as follows:

- You own, or have access to, a TI-89, TI-89 Titanium, TI-92 Plus, or Voyage 200 calculator.
- If you want to transfer files from your calculator to your computer, I assume that you have a computer and know the basics of how to operate it.

# How This Book Is Organized

The parts of this book are organized by tasks that you would like to have the calculator perform.

## Part I: Making Friends with the Calculator

This part describes the basics of using the calculator. It addresses such tasks as adjusting the contrast and getting the calculator to perform basic arithmetic operations.

## Part II: Doing Algebra and Trigonometry

This part tells you how to solve equations, factor polynomials, find partial fraction decompositions, and evaluate trigonometric functions. This part also tells you how to deal with complex numbers and how to find complex solutions to equations.

## Part III: Graphing and Analyzing Functions

In this part, think visual. Part III tells you how to graph and analyze functions and how to create a table for the graph. This part also tells you how to find critical points and inflection points.

## Part IV: Working with Sequences, Parametric Equations, and Polar Equations

This part describes how you can graph and analyze parametric equations, polar equations, and sequences.

## Part V: Doing Calculus

This part is loaded with information on how to do almost anything related to calculus, vector calculus, and differential equations. It tells you how to evaluate integrals, derivatives, limits, dot products, and cross products, and how to graph in 3D. It also tells you how to solve differential equations and how to graph slope fields. It even tells you how to find Taylor polynomials and how to convert between rectangular, cylindrical, and spherical coordinates.

## Part VI: Dealing with Matrices

Part VI gives you the basics on how to add, subtract, multiply, invert, and transpose matrices. And then it delves deeper into the world of matrices by telling you how to use matrices to solve systems of equations and how to find eigenvalues and eigenvectors.

## Part VII: Dealing with Probability and Statistics

It's highly probable that Part VII tells you how to deal with probability and statistics. In particular, my statistics show that it tells you how to generate random numbers, evaluate permutations and combinations, analyze one- and two-variable data, and find a regression equation that models your data.

## Part VIII: Communicating with PCs and Other Calculators

Your calculator joins the information superhighway. Part VIII describes how you can save calculator files on a computer and how you can transfer files from one calculator to another.

## Part IX: The Part of Tens

Part IX contains a plethora of wonderful information. This part tells you about the many wonderful applications you can put on your calculator, and it describes the most common errors and error messages that you might encounter.

# Icons Used in This Book

This book uses four icons to help you along the way. Here's what they are and what they mean:


The text next to this icon tells you about shortcuts and other ways of enhancing your use of the calculator.


The text next to this icon tells you something you should remember so you don't run into problems later. Usually it's a reminder to enter the appropriate type of number so you can avoid an error message.


There is no such thing as crashing the calculator. But this icon warns you of those *few* times when you can do something wrong on the calculator and be totally baffled because the calculator gives you confusing feedback either no error message or a cryptic error message that doesn't tell you the true location of the problem.


This is the stuff you don't need to read unless you're really curious.

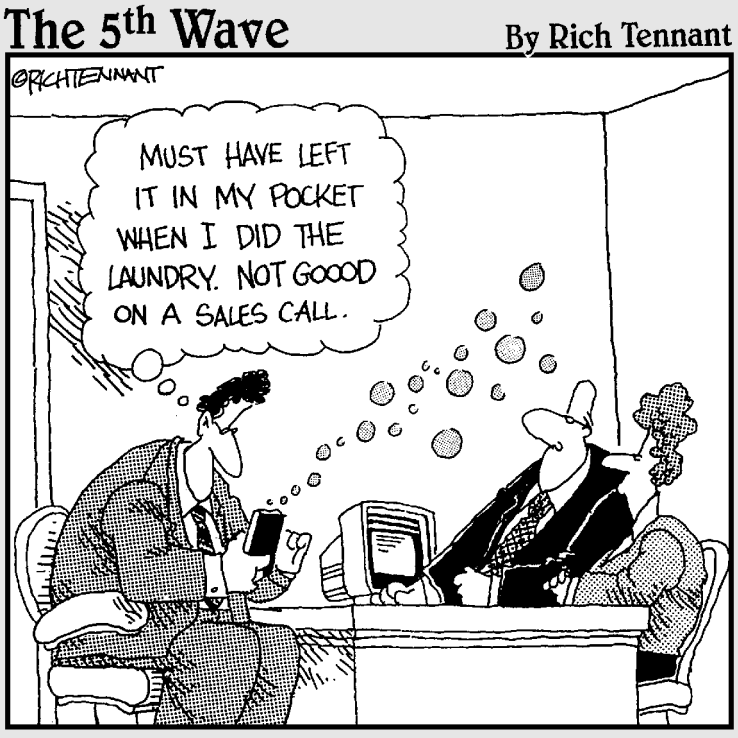
# Where to Go from Here

You don't have to read this book from cover to cover. You don't even have to start reading at the beginning of a chapter. When you want to know how to get the calculator to do something, just start reading at the beginning of the appropriate section. The index and table of contents should help you find whatever you're looking for.

Custom menus for the TI-89 calculator are available at the Wiley Web site at `www.dummies.com/go/ti-89fd`.

# Part I

# Making Friends with the Calculator



## In this part . . .

This part takes you once around the block with the basics of using the calculator. In addition to showing you how to use the calculator to evaluate arithmetic expressions, I discuss the elementary calculator functions — including multi-use keys, menus, modes, and the CATALOG. I also cover the fundamentals of using and combining expressions, including the order of operations and storing and recalling variables. In addition, I explain how to use the numerous functions housed in the MATH Number menu to perform tricks such as finding quotients and remainders when doing long division.

# Chapter 1

# Coping with the Basics

### In This Chapter

- Turning the calculator on and off
- Using the keyboard
- Using the menus
- Setting the mode of the calculator
- Using the CATALOG

TI-89 graphing calculators are loaded with many useful features. With them, you can graph and investigate functions, parametric equations, polar equations, and sequences. You can also produce 3D graphs, contour maps, slope fields, and direction fields. These calculators can even factor expressions and solve systems of equations. And if that's not enough to keep you busy, a TI-89 can integrate, differentiate, evaluate limits, solve differential equations, analyze statistical data, and manipulate matrices. You can even turn this calculator into an e-book reader!

But if you've never used a graphing calculator before, you might at first find it a bit intimidating. After all, it contains several dozen menus, some of which contain three or four submenus. But getting used to working with the calculator really isn't hard. After you get familiar with what the calculator is capable of doing, finding the menu that houses the command you need is quite easy. And you have this book to help you along the way.

## When to Change the Batteries

The convenience of battery power has a traditional downside: What if the batteries run out of juice at a crucial moment, such as during a final exam? Fortunately, the calculator gives you some leeway. When your batteries are low, you see the BATT warning message displayed to the right of the last line of the screen. After you see this message for the first time, the calculator should, according to the manufacturer, continue to function just fine for at least one week. When the batteries are so low that you might not make it

through that final exam, the calculator highlights the BATT warning message, as illustrated in the second picture in Figure 1-1. One exception exists: If you attempt to transfer data or an application from a PC or another calculator to a calculator that has low batteries, the calculator with the low batteries displays a warning message telling you to change the batteries and refuses to make the transfer. (Part VIII explains how to transfer data and applications.)

Because you've likely put batteries into countless toys, you should have no trouble opening the cover on the back of the calculator and popping in four AAA batteries. Above the AAA battery chamber is a panel that opens to the compartment containing the backup battery. The lid of the panel indicates the type of battery housed in the compartment. The manufacturer recommends that you replace this battery every three or four years. So mark your calendar!

# Turning the Calculator On and Off

Press ON to turn the calculator on. (The ON key is the last key in the left column of keys on the keyboard.) The first time you turn on the TI-89 Titanium, you see the application screen, as shown in the first picture in Figure 1-1. On the TI-89, you see the Home screen, as in the second picture in this figure.

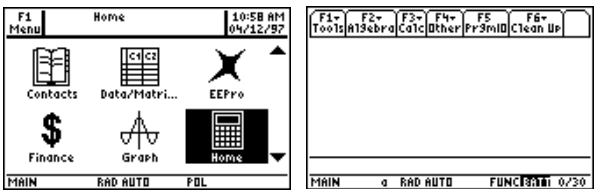



**Figure 1-1:** The TI-89 Titanium Application screen (left) and Home screen (right).

To turn the calculator off, press 2nd and then press ON. (The 2nd key is the second key from the top in the left column of keys.) Pressing 2nd ON to turn off the calculator also exits any application you were using (such as the Graph application) so that when you turn the calculator back on, you're confronted with the Application screen on the TI-89 Titanium or the Home screen on the TI-89.


If you want to turn the calculator off without exiting your current application, press ◆ and then press ON. (The ◆ key is the third key from the top in the left column of keys.) The next time you turn the calculator on, it will be exactly as you left it.