Appendix B: More resources

[B.1] FAQs (Frequently asked questions)

Ray Kremer's Graphing Calculator FAQ

This is Ray Kremer's ultimate TI calculator FAQ:

http://tifaq.calc.org/

Texas Instruments maintains four FAQs for the TI-89, TI-92 and TI-92 Plus calculators, and the GraphLink. Note that the TI-92 FAQ has a lot more information that either the TI-89 or the TI-92 Plus FAQ, and almost all of it applies to all three calculators.

Texas Instruments' FAQ for the TI-89

- Why did TI produce the TI-89?
- How much does the TI-89 cost?
- Where can I buy a TI-89?
- Will there be a TI-89 Plus?
- Is the TI-89 approved for College Board tests?
- What is the size of the TI-89?
- Is the TI-89 available through the Workshop Loan Program?
- Is the TI-89 compatible with the TI-92 and TI-92 Plus?
- Which ViewScreen LCD does the TI-89 use?
- Does the TI-89 work with the TI-GRAPH LINK?
- What Data Collection tools is the TI-89 compatible with?
- How much memory does the TI-89 have?
- What do Flash and electronically upgradable mean?
- What is Advanced Mathematics Software?
- What is the TI-89?
- What is the difference between Hardware Version 1.0 and 2.0?

Why did TI produce the TI-89?
TI listened to educators and students and heard the need for a portable symbolic calculator with more advanced mathematics and engineering features.

How much does the TI-89 cost?
The TI-89 is priced at approximately $150 in the U.S.

Where can I buy a TI-89?
The TI-89 is available in the U.S. and Canada in limited quantities at some retail stores, Instructional Dealers, and college bookstores.

Some locations of these stores may not carry the TI-89. Please contact your local store to ensure availability.

Will there be a TI-89 Plus?
The TI-89 already comes with the Flash memory. It is different from the TI-83 and TI-92, which were introduced before the Flash memory became available on the calculator. Therefore there is no need to introduce a Plus version of the TI-89 with the Flash memory update. TI has four graphing calculator models with Flash capability: TI-73, TI-83 Plus, TI-89, and TI-92 Plus.

Is the TI-89 approved for College Board tests?
The TI-89 has been approved for some College Board tests, including AP Calculus and SAT.

What is the size of the TI-89?
The TI-89 will be the same size as the TI-83/86: 1.0 x 3.5 x 7.3 (in.).

Is the TI-89 available through the Workshop Loan Program?
Yes, teachers can borrow individual TI-89s for short term loans through TI's Workshop Loan Program. Loans are based on availability.

Is the TI-89 compatible with the TI-92 and TI-92 Plus?
Yes, the programming functions and data on the TI-89 will transfer directly to and from a TI-92 Plus using the included unit-to-unit link cable. Data and programs containing original TI-92 functions will transfer directly to and from a TI-89.

Which ViewScreen LCD does the TI-89 use?
The TI-89 ViewScreen calculators use the same ViewScreen panels as the TI-92.

Does the TI-89 work with the TI-GRAPH LINK?
Yes. The TI-89 will works with the TI-GRAPH LINK cables.

What Data Collection tools is the TI-89 compatible with?
The TI-89 is compatible with CBL, CBL2, and the CBR.

How much memory does the TI-89 have?
The TI-89 provides two types of memory: RAM and user data archive memory. The user available RAM is about 188K and can be used for computations and storing programs and data. The user data archive has 384K of available space for storing additional programs and data.

What do Flash and electronically upgradable mean?
Flash is a technology that allows the calculators software to be upgraded electronically. Using the TI-GRAPH LINK cable and the link I/O port, the software can be updated with the latest maintenance updates or new software versions.

What is Advanced Mathematics Software?
Advanced Mathematics Software is the name of the software features available on the TI-89. The software is named to identify which version of software is running once electronic updates are available. This is the same Advanced Math Software of the TI-92 Plus, without the Geometry application.

The key features of Advanced Mathematics Software are the Computer Algebra System, differential equations, linear algebra, unit conversions, systems of equations, and 3D graphing with contour plots and rotation.

What is the TI-89?
The TI-89 is a vertical graphing calculator that includes a symbolic Computer Algebra System (CAS), Advanced Mathematics Software, and Flash technology that enables electronic upgradability.

What is the difference between Hardware Version 1.0 and 2.0?
TI frequently makes running changes to the hardware of its calculator products. If you purchased a TI-89 after July 1999, it may include some minor hardware updates as described below. You can identify these calculators by the statement "Hardware Version 2.0" on the About screen (press F1, A:About...). All TI-92 Plus calculators have Hardware Version 2.0.

- Altered the management of the user portion of the Flash ROM. You will recognize this update only when the Advanced Mathematics Software Version 2.0 operating system is installed. With hardware version 2.0 and the 2.0 operating system, you have more user archive space while the total amount of Flash ROM is unchanged.
- Once a user has loaded the 2.0 operating system and a few applications, the hardware version 2.0 and the original TI-89 are practically the same. This scenario is expected for most users in the future as many great application ideas are floating around.
- Slightly increased the processor speed from about 10 MHz to about 12 MHz.
- TI-92 Plus only: Removed the TI-92 Plus Module compartment.

Note: New TI-89 operating system software, Advanced Mathematics Software v1.05, was required to support the hardware changes. Therefore, Hardware Version 2.0 will reject earlier versions of the operating system software.

Texas Instruments FAQ for the original TI-92

http://education.ti.com/product/tech/92/faqs/faqs.html

This FAQ applies to the original TI-92, not the current TI-92 Plus. However, much of the information is still valid, and it answers more questions than the TI-92 Plus FAQ.

- comDenom() (common denominator) function algorithm.
- Changing the order of steps gives different answers sometimes - why?
- Difference between [diamond] [OFF] and [2nd] [OFF].
- fMin() (symbolic minimum) function algorithm.
- fMax() (symbolic maximum) function algorithm.
- factor() function algorithm.
- I have two TI-92s that simplify the same expression differently.
- limit() function algorithm.
- Similar expressions simplify differently - why?
- Simplifications - why are some so slow?
- Sigma(1/(n^3),n,1,infinity) doesn't return an answer - why?
- Simplification ignores path names for variables - why?
- Scrolling a long answers on the Program IO screen.
- Replacing the cover (snap cover) back on the TI-92.
- Product function (symbolic) algorithm.
- Programming language - is the TI-92's like the 82 and 85?
- Programming language of the TI-92 - is it BASIC?
- propFrac() (proper fraction) function algorithm.
- Superscripted numbers appear on multiple output statements - why?
- Soft Warehouse's TI-92 Program Library.
- Symbolic Manipulation (Computer Algebra) - what is it?
- taylor() (taylor series) function algorithm.
- Some numbers not effected when I change certain mode settings-why?
- Summation function (symbolic) algorithm?

- solve() function - why does it not find all the solutions?
- Solve ignores With (|) constraints with trig functions - why?
- Store a value to a matrix element.
- nDeriv() (numeric derivative) algorithm.
- Calculator will not accept a key press - why?
- Can I use the link port for my own applications?
- Adding features to the existing TI-92.
- Anti-derivatives - why can't the TI-92 find them for all expressions?
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- arcLen() (arc length) function algorithm.
- Cabri Geometry II features not in the TI-92.
- AUTO modes function - what is it?
- Answer in back of the book is different from the TI-92 - why?
- avgRC() (average rate of change) algorithm
- cSolve() (complex solve) function algorithm
- solve() (symbolic solve) algorithm.
- Control pad - how many directions will it move the cursor?
- cFactor() (complex factor) function algorithm
- Complex numbers sometimes round a component to zero - why?
- Circular Definition Error.
- Construct an ellipse in TI-92 Geometry.
- cZeros() (complex zeros) function algorithm
- Does TI supply a TI-92 ViewScreen and the separate parts?
- Division by zero - how can I create this error?
- Display an angle in DMS format on the Program I/O screen.
- Display - does it scratch?
- Differential equations - why doesn't the TI-92 have them?
- DERIVE - does the TI-92 have ALL of DERIVE's features?
- Define a function from a program prompt.
- fMin() and fMax() are hard to use in programs.
- Equation for the graph on the cover of the TI-92 manual.
- fMin(expresn, x) and fMax(expresn, x) return only x values - why?
- expand() function algorithm
- Error FOLDER when I try to copy a var in VAR-LINK why?
- Equation Solver on the TI-92?
- For loop slower on the TI-92 than the TI-8x products - why?
- I only have 70K bytes for user memory - why?
- Gamma Function
- Implicit differentiation
- How "complete" is the TI-92's symbolic manipulation?
- Geometry figure on TI-92 manual - how to create it.
- infinite sums - why does the TI-92 only compute certain ones?
- Memory requirement to open any application on the TI-92?
- Maximum number of variables?
- Locked variables don't show up in open dialog box choices - why?
- Limit() returns an answer when you expect undefined - why?
- Why does the TI-92 returns 0 for limit(sqt(1-x),x,1) when it should be undefined?
- Integration (symbolic) function algorithm
- nSolve() (numeric solve) function algorithm
- nInt() (numeric integration) algorithm
- Print history area on TI-92
- Number bases other than decimal on the TI-92
- nsolve() - why does it sometimes take so long to find a solution?

- Press ENTER twice in a dialog box to save settings - Why?
- min() function - why does it not work on strings?
- Pictures in TI-92 Toolbars
- Phase Planes on the TI-92
- Verifying a symbolic result
- d() (symbolic differentiate) algorithm
- I can't get my cover (snap cover) off. How do I get it off?
- How is the application-specific 68000 different from a regular 68000?
- Graphing and Geometry screens differ by one pixel each way - why?
- Implied multiplication-x[space](a+b) is not read as multiplication?
- Limiting the glare off the screen in classrooms
- Integration - why is a numeric answer returned when I expected symbolic?
- Menu options are fuzzy - Why?
- tCollect() (trig collect) function algorithm
- tExpand() (trig expand) function algorithm
- Trig functions return unexpected answers in DEG mode - why?
- View the name of the variable currently in any editor
- ViewScreen connector - does every TI-92 have it?
- What is under the little screwed in cover plate under the back case?
- When doesn't work as expected in a data variable - why?
- Why does 4^x get simplified into 2^{2x}?
- Why, when I enter solve (sin(x)=0,x) do I get x=@n1*pi? (TI-92)
- zeros() function algorithm

comDenom() (common denominator) function algorithm.
Term by term, comDenom(a/b+c/d) reduces (a*d+b*c)/(b*d) to lowest terms, and repeats this process for each additional term.

Changing the order of steps gives different answers sometimes - why?
There are times that changing the order of steps in a problem are valid and do not affect the mathematics. In these cases, the end result can "look" different because the simplification process had different forms of expressions to work on each time.

Difference between [diamond] [OFF] and [2nd] [OFF].
Let's say the you are in the graphing screen and want to turn the unit off. If you press [2nd] [OFF] the calculator will reset back to the home screen and then turn off. So, when you turn it back on you go back to the home screen instead of where you were.

If you use the [diamond] [OFF] this emulates APD (Automatic Power Down). This means that when you turn the unit back on, you go back to where you were.

fMin() (symbolic minimum) function algorithm.
For fMin(expr,var), if d(expr,var) cannot be computed symbolically, a combination golden-section parabolic interpolation search is performed for one local minimum. (R. Brent, "Algorithms for Minimization without Derivatives", Prentice-Hall, 1973.) Otherwise, fMin(expr,var) is determined by solve(d(expr,var)=0,var), filtered by attempting to determine the signs of higher-order derivatives at these candidates. Surviving candidates are compared with the limits of expr as var approaches inf and -inf; and also with points where expr or its derivative is discontinuous.

fMax() (symbolic maximum) function algorithm.
fMax() is similar to fMin(). See fMin() for more information.

factor() function algorithm.

The methods include the well-known factorizations of binomials and quadratics, together with methods described by Geddes, Czapor and Labahn, "Algorithms for Computer Algebra", Kluwer Academic Publishers, Boston, 1992. Laguerre's method is used for approximate polynomial factorization. (Press et. al: "Numerical Recipes" Cambridge University Press, 1986.)

factor(returns the rational number factored into primes and a residual having prime factors that exceed 65521.

I have two TI-92s that simplify the same expression differently.

Why? With slight modifications that have been made to the TI-92 ROM there have been some very specific examples that do not evaluate the same from version to version. Other problems may evaluate differently or not at all. A change may not have been made in the TI-92 symbolic manipulation code to directly correct this example. It most likely was an indirect result of changes made for other reasons. You will also be able to find examples of problems that will not evaluate on later TI-92's that would on earlier versions. This is the nature of dealing with CAS software.

limit() function algorithm.

Limits of indeterminate forms are computed by series expansions, algebraic transformations and repeated use of L-Hopital's rule when all else fails. Limits of determinate forms are determined by substitution.

Similar expressions simplify differently - why?

The goals of default simplification are to ensure that critical cancellations occur, without unnecessarily applying drastic transformations that might consume an unacceptable amount of time or exhaust memory. Simplification is necessarily a compromise between these conflicting goals.

Minor appearing differences between expressions can cause dramatic differences in the default simplification path. For example, there is an effort to retain most polynomial factoring, but adding a term to a factored polynomial can cause the polynomial to be expanded. Similarly, there is an effort to avoid common denominators, unless denominators share a common factor, so some fractions combine while others don't. As another example, x orders more main than y, so merely changing the names of variables can affect how much expansion and common denominators occurs.

Also, the default simplification path can depend strongly on the mode settings.

There are so many potentially useful mathematical transformations that it is not feasible to fit them all in the limited amount of program ROM. Consequently, a useful transformation that you desire might not be in the TI-92. For example, x*x^n will not simplify to x^(n+1) because this is not one of the rules built in. Another example is integral(x^(n-1),x) will simplify to x^n/n, but integral(x^(n+1),x) will not simplify.

Simplifications - why are some so slow?

Some operations can be inherently slow for rather simple operands. Examples include factoring, simplification of fractional powers, and cancelation of hidden factors between non-numeric numerators and denominators. In some cases, intermediate expressions can become quite large despite modest inputs and final results.

If a problem is taking an unacceptable amount of time:

1. Try using a different mode, such as diamond-enter versus enter.
2. Try using an appropriate alternate function, such as nSolve() versus solve() or nINT() versus integral().

3. Try solving a simpler related problem: For example, substitute appropriate simple numbers for some of the variables, or conversely try substituting variables for some of the messy constants or subexpressions.
4. Use a simpler physical model (such as ignoring friction).
5. Use the taylor() function or other means to replace an expression with a simpler approximation.

Sigma(1/(n^3),n,1,infinity) doesn't return an answer - why?
The function sum (1/(n^k), n, 1, infinity) (the sum of 1/ (n raised to the k-th power) as n goes from one to infinity) works when k is an even number, but when k is odd the unit simply returns the expression.

Example:

3->k

sum(1/(n^k),n,1,infinity).

The unit returns (in pretty print),

Reason:

Without the Riemann zeta function, there is not an exact closed form of that answer unless k is even and greater than one. DERIVE and Maple have a built-in Riemann zeta function, but the TI-92 doesn't. However, you can always approximate the result by using a large constant in place of infinity.

Simplification ignores path names for variables - why?
Path names are simplified when they reference a defined variable. The contents of the defined variable replace the path name in the expression. For undefined variables, there is not any attempt to determine if the paths are referencing the same variable. For example, with the main folder current, x+main\x ENTER will not simplify to 2x even though they are really the same variable.

Scrolling a long answers on the Program IO screen.
You cannot scroll answers on the IO screen. You must display the answer on the Home Screen before you can scroll through it.

Replacing the cover (snap cover) back on the TI-92.
The cover only fits on the TI-92 one way. Be sure that the tabs on the top sides of the calculator match up with the inserts in the cover. Also, the printing on the outside of the cover should be right side up when placed on the calculator.

Product function (symbolic) algorithm.
Iterated multiplication is used for modest numeric limits. Other products are determined by checking for telescoping products and simple patterns. Limits are used for infinite product limits.

Programming language - is the TI-92's like the 82 and 85?
The TI-92 contains a superset of the TI-82 and TI-85 programming language. A number of features were added to specifically address needs from TI-82 and TI-85 users like: memory management, deleting variables, enhanced string features, enhanced graphics features, local variables, user defined functions, and parameter passing with programs and functions.

Programming language of the TI-92 - is it BASIC?
No. There are a number of features that are similar to the BASIC programming language, but it is not BASIC.

propFrac() (proper fraction) function algorithm.

propFrac() uses polynomial division with remainder to determine the quotient polynomial and the numerator of the resulting fraction.

Superscripted numbers appear on multiple output statements - why?

Some number are superscripted on multiple output statements because the "pretty print" is on. In the pretty print mode, the unit will calculate the size in pixels of the rectangle needed to hold this output. The coordinates given start in the upper left most corner of the calculated rectangle needed to hold the output. The second OUTPUT command doesn't know the size of the previous output, so if the coordinates given in OUTPUT #2 aren't specified correctly by the user then they will see overlapping or superscripting on the screen.

There are two ways to get around this. First, a person can calculate his/her coordinates for the OUTPUT command through trial and error. Second, they can create a single string containing the results of the multiple outputs and then perform one OUTPUT command using that one large string.

Soft Warehouse's TI-92 Program Library.

This library includes supplementary functions and subroutines that add to the functionality of the TI-92. It is available for free download .

The library is currently divided into the following three TI-GRAPH LINK group files:

UNIT.92G implements automatic units algebra and conversion.

ELEM.92G implements pre-calculus mathematics capabilities such as solution of simultaneous nonlinear equations, general regression, contour plots and plots of implicitly-defined functions.

ADV.92G implements more advanced mathematics capabilities such as symbolic solution of differential equations and vector calculus.

Each group includes a corresponding "about...()" program. It states the purpose of the folder, the copyright and abbreviated free copy provisions, then "installs" the folder by performing some housekeeping and setup tasks.

Symbolic Manipulation (Computer Algebra) - what is it?

The terms Symbolic Manipulation or Computer Algebra describe a software feature set that use the mathematical rules of algebra and calculus to simplify expressions full of symbols and undefined variables as well as numeric values. Some examples are:

x+3x-y+4y will simplify to 4x+3y

solve(2x-3=y,x) will return the solution x=(y+3)/2

derivative of 3x^4 with respect to x will simplify to 12x^3

(x^3+x)/2x will simplify to (x^2+1)/2

taylor() (taylor series) function algorithm.

taylor(u,x,n,a) is sum(limit(d(u,x,k),x,a)*(x-a)^k/k!,k,0,n), computed iteratively to avoid redundant computation of lower-order derivatives.

Some numbers not effected when I change certain mode settings-why?
Check to see what type of numbers you are using. The "Display Digits" and "Exponential Formats" do not effect integers and rational numbers.

Summation function (symbolic) algorithm?
Iterated addition is used for modest numeric limits. Other sums are determined from formulas given in references such as "Standard Mathematical Tables and Formulae", CRC Press, together with tests for telescoping sums. Limits or special formulas are used for infinite summation limits.

solve() function - why does it not find all the solutions?
The TI-92's solve() function attempts to solve an equation analytically to get an exact representation of the solution(s). When it cannot do so, it uses numerical search techniques to attempt to find approximate solutions. These search techniques cannot guarantee to find any or all solutions. When multiple solutions are found, they cannot be guaranteed to be consecutive ones. Search techniques are highly sensitive to the nature of the equation and the form in which it is given, the properties of the individual functions, the fixed precision limitations of the floating point arithmetic, and any boundaries placed upon the search.

In the case of sin(x)=cos(x) the solve() function can determine the exact solutions and can represent them as an infinite family using the "arbitrary integer" notation (@n1). However, in the case of cos(x)=-2e^(-2x), the equation is transcendental. The number of solutions is infinite, and the solutions do become closer and closer to the roots of cos(x) as x moves toward infinity. However, the solutions are not periodic and, in general, can only be approximated.

A very useful technique when using the solver is to graph the left and right sides of the equation and look for intersections on the graph. Or, graph the difference between the left and right sides and look for crossings of the x-axis. Investigating the equation graphically often suggests reasonable bounds that can be placed on the solve() function using the with (|) operator. Providing reasonable bounds often greatly improves the success of the numerical search techniques.

Solve ignores With (|) constraints with trig functions - why?
If the TI-92 is able to find an exact solution to an equation, and this solution is an infinite family of solutions, the restrictions after the With operator are ignored. The answer returned will contain the arbitrary integer notation and will not return specific answers within the given range.

If the TI-92 is unable to find an exact solution, then it resolves to using a numeric search for the solutions (except in Exact mode). During a numeric search, the TI-92 will apply the constraints to the solutions returned. If nsolve is used, the solution returned will be within the given range. However, nsolve will only return one solution.

If the TI-92 is able to find a finite many exact answers, then the constraints will also be applied.

Examples:

solve(sin(x/2)=cos(x/2),x) | x>=0 and x<2Pi returns ((4@n -3)*pi) / 2 (radian/ auto mode)

nsolve(sin(x/2)=cos(x/2),x) returns -42.4115 (radian/auto mode)

nsolve(sin(x/2)=cos(x/2),x) | x>=0 and x<2Pi returns 1.5708 (radian/auto mode)

solve(sin(2x)=cos(x),x) returns a list of several values (radian/auto mode)

solve(sin(2x)=cos(x),x) | x>=0 and x<2Pi returns list of answers in given range (radian/auto mode) nsolve(sin(2x)=cos(x),x) returns -10.9956   (radian/ auto mode)

nsolve(sin(2x)=cos(x),x) | x>=0 and x<2Pi returns 4.71239   (radian/auto mode)

Store a value to a matrix element.
If mat1 is a 3x3 matrix, then 12->mat1[2,3] will store the value of 12 in the 2nd row, 3rd column position. The TI-8x products used parenthesis instead of square brackets to do this. Parenthesis on the TI-92 are reserved for function and program calls.

nDeriv() (numeric derivative) algorithm.
nDerive(f(x),x,h) => (f(x+h)-f(x-h))/(2h)

Calculator will not accept a key press - why?
A key may be stuck down, putting it in the active position. This blocks any other key from being accepted and your TI-92 may appear to be locked up. Unstick the key and you should be ready to operate.

Can I use the link port for my own applications?
No, the link port was designed to optimize our communications speed and the protocal is not general enough for other applications.

Adding features to the existing TI-92.
Through the use of programs, user-defined functions, and geometry macros, you can add functionality to the TI-92. User written programs and functions can be downloaded from the program archive

You can also upgrade your TI-92 with the TI-92 Plus Module with Advanced Mathematics Software.

Anti-derivatives - why can't the TI-92 find them for all expressions?
Finding anti-derivatives can be very difficult, requiring more program ROM than is available. Moreover, it is theoretically impossible to express all anti-derivatives as a finite composition of the functions and operators built-into the TI-92.   However, the TI-92 will find anti-derivatives for most integrands encountered in most calculus texts and in tables such the the CRC handbook.

There is a function nInt() for finding numerical values of definite integrals where anti-derivatives can not be found using the symbolic techniques. In Auto mode, numerical techniques are used automatically when needed for definite integrals.

Can't see displays because of the classroom lighting.
Try adjusting the display contrast using [diamond] [+] to darken the display or [diamond] [-] to lighten the display. Also try using the cover as a stand to improve your viewing angle.

arcLen() (arc length) function algorithm.
The implemented textbook definition arclen (u,x,a,b) = integral (sqrt (1 + d(u,x)^2), x, a, b) is actually a more useful arc-DISPLACEMENT: The integrand is positive for real u.

If the lower limit exceeds the upper limit, then dx is negative, making the result negative.

Cabri Geometry II features not in the TI-92.
Conics, circle filling, multiple animation, and construction replay. Also some computer specific functions (like color selections and cut/copy/paste) have been removed.

Cabri II is not built in the TI-92. Texas Instruments worked with the authors of Cabri Geometry II to jointly develop a geometry package for the TI-92. Many of the features of Cabri II are in the TI-92.

AUTO modes function - what is it?
The AUTO mode will, through a predetermined method, display answers as either exact or approximated results. This mode will display default to an exact answer unless the answer becomes "messy" or would be better understood as an approximation.

Answer in back of the book is different from the TI-92 - why?
When a symbolic result is different than what you expected you can use several tools in the TI-92 to help verify that the result is equivalent:

1. Try subtracting the result from the expected result to see if simplifies to zero.
2. Try graphing the result you expected and the result you got from the TI-92.
3. Try using some of the manipulation features like expand(), factor(), comDenom(), etc. to see if you can force further simplification of either result or better yet, their difference.
4. Try substituting appropriate random values for some or all of the variables in each of the two expressions.

avgRC() (average rate of change) algorithm
avgRC(f(x),x,h) => (f(x+h)-f(x))/h

cSolve() (complex solve) function algorithm
cSolve() is the same as solve() , except the domain is temporarily set to complex so that complex solutions are sought and not rejected.

solve() (symbolic solve) algorithm.
solve() uses factoring together with the inverses of functions such as ln(), sin(), etc. Except in exact mode, these techniques might be supplemented by heuristics to isolate solutions, followed by nSolve() to refine approximations.

Control pad - how many directions will it move the cursor?
The control pad moves in eight directions.

cFactor() (complex factor) function algorithm
cFactor() is the same as factor(), except the domain is temporarily set to complex so that complex factors are sought and not rejected.

Complex numbers sometimes round a component to zero - why?
The TI-92 rounds the real or imaginary part to 0.0 if its magnitude is less than 1E-13 times the magnitude of the other component. This is done to recover real or pure-imaginary results when small roundoff errors make both components non-zero.

Circular Definition Error.
A software change was made in the TI-92 to detect function and program calls that have expressions of symbolic variable argument names that are the same as those used to define the function or program. The error "Circular definition" will occur if that is detected.

Unexpected results can occur when a function or program is called with some form of the same variable name that was used when defining the argument in the function or program definition.

For example, on the home screen:

define f(x)=ln(ln(x)+x)	(Done)
f(x+1) simplifies to ln(ln(x+1)+x+2)	(unexpected result!)

To avoid this, functions and programs should be defined with argument variable names that WILL NOT be used as arguments during subsequent function or program calls. We suggest you avoid choosing variable names like x,y,z,a,b,c,... for argument names when defining a function or program. These common variable names are frequently used and could easily be included as an argument in a function or program call. Instead, choose variable names like xx, xtemp, yy, ytemp, zz, ... for argument names when defining a function or program. By doing this, you can then use x,y,z,a,b,c... when you call the function or program. This minimizes any chance that you will call a function or program with an argument name that could produce an unexpected result.

For example, on the home screen:

define f(xx)=ln(ln(xx)+xx) (Done)
f(x+1) simplifies to ln(ln(x+1)+x+1) (expected result)

One common area where the simplification problem can occur is in the study of composition of functions. For example, simplifying f(g(x)) with defined functions f(x) and g(x) to see the composition of "f composed on g". When the functions f(xx) and g(yy) are defined, the simplification of f(g(x)) will then give expected results.

For example, on the home screen,

define f(xx)=xx^2 (Done)
define g(xtemp)=xtemp+1 (Done)
define h(yy)= yy^(1/2)+1 (Done)
f(g(x)) simplifies to (x+1)^2 (expected result)
h(f(x)) simplifies to abs(x)+1 (expected result)

If the arguments in a function or program call are not symbolic, then all simplification will work as expected. Composition of functions is also commonly studied when graphing y2(y1(x)). Because the graphing application on the TI-92 is completely numeric, all composition of functions in graphing work as expected. However, the TI-92 graphing functions y1(x),y2(x),..., y99(x) enforce the use of x as the argument variable name. Therefore, if these system graphing functions are used to study composition of functions symbolically on the home screen, unexpected results can occur.

You can determine whether your version of the TI-92 includes the newer software by doing the following:

On the home screen enter, define f(x)=x^2 (done). Then enter f(x+1). If you get an error "Circular definition" then you have the newer software. If you get a simplified result of (x+1)^2, then you have the older software.

Construct an ellipse in TI-92 Geometry.

- Construct a circle.
- Construct a point (A) on the circle. Construct a point (B) inside the circle.
- Connect those points.
- Construct the perpendicular bisector of the segment between points A and B.

From here you have two options to construct the ellipse.

- Construct the locus of the bisector as point A moves on the circle -- the envelope of lines is the ellipse. This means that the line we constructed is tangent to the ellipse. The point of tangency is *not* the midpoint of the segment.

- Construct a segment from the center to the point A. Construct a point (C) at the intersection of the bisector line and this radius. Construct the locus of point C as point A moves on the circle. That will form an ellipse.

cZeros() (complex zeros) function algorithm
cZeros(expr,var) is expr>list(cSolve(expr=0,var),var).

Does TI supply a TI-92 ViewScreen and the separate parts?
Since every TI-92 sold in the US has the ViewScreen remote panel connector TI does not supply the separate VSCalc like other models of graphing calculators. We also expect more demand for the ViewScreen LCD panel for the TI-92 than for previous models because teachers can buy the TI-92 first and then upgrade to the ViewScreen later.

Dealers can manage their inventory better by just stocking the TI-92 and VS-LCD and putting them together as needed to make up ViewScreen packages. TI only sells those two parts to dealers and does not sell a 92VS combination. TI has adjusted the price on the 92VS-LCD so that a TI-92 and 92VS-LCD together have the same dealer price as the ViewScreen was quoted before.

We still expect dealers to list the 92 ViewScreen on their price sheets.

Division by zero - how can I create this error?
A division by zero error is only created while using the Graph/Math functions. You will not encounter a division by zero error when working with the CAS on the home screen or in a program.

Display an angle in DMS format on the Program I/O screen.
You can only display values in Degrees-Minutes-Seconds format on the Home Screen.

Display - does it scratch?
Yes, the display can scratch. Please be careful not to touch the display with pencils, erasers, or any sharp objects.

Differential equations - why doesn't the TI-92 have them?
There are several reasons why a product feature is included or excluded. To make products affordable, we have to limit the amount of memory (ROM) used for the system software; more ROM means higher cost. Therefore, we spend a great deal of time talking to educators about the features that are most useful in the classroom to the most students. For example, there are much fewer students taking college differential equations than taking high school algebra.

The features that have been on previous products that are not on the TI-92 are: differential equation graph mode, some extra linear algebra functions (eigenvalues,eigenvectors, LU decomposition, cond), and an interactive solver.

DERIVE - does the TI-92 have ALL of DERIVE's features?
The computer algebra software in the TI-92 is not DERIVE, in whole or part. It was jointly developed by Texas Instruments and the authors of DERIVE. It will do some things that DERIVE will not do and DERIVE will do some thing the TI-92 will not do. Generally, however, it is a fully capable symbolic manipulation package.

Define a function from a program prompt.
To Define a function from a program prompt, convert the function contents to a string (if it is not already) and use the expr() function: expr("function string"&"store f(x)")

Example:

```
...
inputStr "enter your function in x", var1
expr(var1&"store y1(x)")
...
```

fMin() and fMax() are hard to use in programs.

The functions fMin() and fMax() return a list of candidate "x values" where minimums or maximums could occur. The result is returned in the form of " x=2 or x=4 or x=19 ...". To get at the actual values of the candidates, use the exp>list() conversion function. The exp>list() function returns the right hand sides of the x=2 or x=4 ... (like) boolean results.

Equation for the graph on the cover of the TI-92 manual.

The equation for the graph found on the cover of the TI-92 manual is:

$$z(x,y) = \frac{20\cdot\cos\left(\frac{x^2+y^2}{4}\right)}{x^2+y^2+\pi}$$

WINDOW:

eyetheta = 20	ymin = -5	zmin = -1.2953 (approx)
eyephi = 70	ymax = 5	zmax = 6.3662 (approx)
xmin = -5	ygrid = 20	zscl = 1
xmax = 5		
xgrid = 20		

fMin(expresn, x) and fMax(expresn, x) return only x values - why?

If you have the x values where minimums or maximums occur, then it is easy to get the expression values at those points by using the "with" operator. If we were to return instead the expression values that are maximum or minimum, then the corresponding x values would be lost.

expand() function algorithm

Polynomial expansion is done by repeated application of the distributive law, interleaved with use of the associative and commutative laws to collect similar terms.

Error FOLDER when I try to copy a var in VAR-LINK why?

The copy var utility is for copying a variable to another folder, retaining the same variable name. If you want to make a copy of a variable in the same folder you must first copy the var to another folder, rename it, and then copy it back to the original folder.

Equation Solver on the TI-92?

The 92 doesn't have a Solver editor like the TI-85, but the TI-92 does have a more general Solve().

For example:

    Solve(x^2+3y+4z=26,x)|y=2 and z=4   x=2 or x=-2

or symbolically

    Solve(x+2y+7z=17,x)   x=-2y-7z+17

For loop slower on the TI-92 than the TI-8x products - why?
The For..EndFor loop on the TI-92 uses its arguments to compute the remaining step count every time thru the loop. This provides great flexibility. If variables are used to specify the step size and end value, then these variables, along with the index variable, can be altered within the body of the loop, thus affecting how the loop operates.

The TI-8x products did not do this. They allow the index value to be altered within the body of the loop, but the end value and the step value are computed only once when the loop is started.

I only have 70K bytes for user memory - why?
The TI-92 system has a lot of integrated software and it needs memory (RAM) to allow all the features to work correctly.

Gamma Function
Define gamma(n)=integrate(x^(n-1)*e^(-x),x,0,infinity)

gamma(5) returns 24. If n is an integer, gamma(n) returns (n-1)!

Implicit differentiation
Why does d(x^2 + y^2, x) return 2x, not -2x/(2y)? What is happening is that since you are taking the derivative with respect to x, y is viewed as a constant. A constant squared is still a constant and the derivative is zero, hence the answer.

Here is a first derivative implicit differentiating function based on a more general function found in DERIVE.

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

where uu is an expression that equals 0, and d() is the derivative function. The variables xx and yy are used to avoid a circular definition error that will occur when you differentiate a function of x and y.

Then, enter, for example:

    impdif(x^2+y^2,x,y)

-x/y is returned, which is the reduced form of -2x/(2y)

How "complete" is the TI-92's symbolic manipulation?
The symbolic manipulation features set was designed with teachers around the country to address the needs of Algebra I, Algebra II, Trig, Pre-Calculus, and Calculus courses.

Geometry figure on TI-92 manual - how to create it.
To create the locus on the manual follow these steps:

- Go to the geometry editor.
- Draw a segment. (F2, 6)
- Put a point on the line a couple of centimeters from the left end point. (F2, 2)
- Create a perpendicular line through the line segment at this point. (F4, 1)
- Draw a circle with the center on the perpendicular line and the radius point being the intersection point of the segment and perpendicular line. (F3, 1)
- Measure the distance from the left endpoint to the intersection point of the circle and the segment. (F6, 1)

- Now you need to transfer that measurement onto the circle. Select F4, 9 (measurement transfer). Then select the measurement from step 6. Then select the circle. Next select the intersection point of the circle and the segment. A point will appear on the circle.
- Reflect this point across the perpendicular line. (F5, 4, select the point, then select the perpendicular line) A new point should appear on the other side of the perpendicular line.
- Hide the perpendicular line and the first point created on the circle. (F7, 1, click on the line, click on the point)
- Now change the format of the Locus to be nonlinked points. (F8, 9, set Link Locus Points to OFF)
- The last step is to draw the locus. Press F4, A, select the point reflected across the perpendicular line and then select the intersection point.

The locus will appear after the last step.

infinite sums - why does the TI-92 only compute certain ones?
The TI-92 symbolic math pack can only recognize certain sums. We built in what we thought was most needed to support the Calculus curriculum.

Memory requirement to open any application on the TI-92?
Geometry requires about 23K bytes of free memory to start a new session. All other applications require less than 100 bytes to create/open an empty file.

Note: The amount of free memory required to open existing files is dependent on the size of the file.

Maximum number of variables?
If the data types are small enough that free memory does not become an issue, you can store approximately 800 different variables.

Locked variables don't show up in open dialog box choices - why?
The purpose of locked variables was to keep the variable from changing. All of the editors (Program, Geometry, Data/Matrix, Text) edit the variable directly in memory (they don't work on a copy of the variable, but instead the only copy of the variable). So, to edit one of these variable, you must first unlock it from either the Var-Link dialog box or using the Unlock command.

Limit() returns an answer when you expect undefined - why?
Why does the TI-92 returns 0 for limit(sqt(1-x),x,1) when it should be undefined?
The limit actually does exist from the right side, it is just an imaginary solution not a real one. That is where the problem arises. Right now, the TI-92 does not filter out answers like this. In fact, an answer should only be returned if you approach 1 from the left side. From both sides and from the right side it should not exist. This is simply a limitation of the TI-92 (and some other CAS systems).

In cases like this, it is a good idea to check the problem using two or three different methods.... limit on home screen, graph the argument, and use the table.

Integration (symbolic) function algorithm
Antiderivatives are determined by substititutions, integration by parts, and partial-fraction expansion, much as described by J. Moses ("Symbolic Integration: The Stormy Decade", Communications of the ACM, August 1971, Volume 14, Number 8, pp. 548-559.) Antiderivatives are NOT computed by any of the Risch-type algorithms.) Definite integrals are determined by subdividing the interval at detected singularities, then for each interval, computing the difference of the limit of an antiderivative at the upper and lower integration limits. Except in exact mode, nINT() is used were applicable when symbolic methods don't succeed.

nSolve() (numeric solve) function algorithm
nSolve() uses a combination of bisection and the secant method, as described in Shampine and Allen "Numerical Computing: An Introduction", W.B. Saunders Co., 1973.

nInt() (numeric integration) algorithm
nInt() uses an adaptive 7-15 Gauss-Kronrod quadrature somewhat like the algorithm described in Kahanner, Moler and Nash.

Print history area on TI-92
You can save the entries in the home screen to a text file, send this to the computer and print it. To save the history area as a text object, do the following:

- From the Home Screen, press F1.
- Select Save As....
- Give the text file a name.

You can then open this file in the text editor of the TI-92 or send it to the computer and print.

Number bases other than decimal on the TI-92
The TI-92 cannot work with numbers in bases other than decimal without a special program. Check out the Soft Warehouse TI-92 Program Library for such a program.

The reason the TI-92 does not have this function is simply that the teachers we spoke with when designing it thought that other functions were more important than base conversions/arithmetic.

nsolve() - why does it sometimes take so long to find a solution?
The nSolve() function uses symbolic techniques to simplify the equation before applying the search technique. Depending on the equation, this simplification can take significant time. For example, solving the Time-Value-of-Money equation for the interest rate can cause expansion of a high-degree polynomial.

func-type User-defined functions are not simplified prior to the numeric search. Consequently, to avoid the time-consuming simplification, use the program editor to define your equation in the following form:

```
:myeqn ()
:Func
:   ... = ...
:EndFunc
```

Then on the home screen enter an expression such as:

```
nSolve (myeqn(), x)
```

Also, using the "with" operator to appropriately constrain the search range can greatly speed the solution. For example, it is very important to restrict the interest rate to positive values when solving the Time Value of Money equation for the interest rate, and it is also helpful to restrict it to be less than some generously large number for a realistic interest rate.

Press ENTER twice in a dialog box to save settings - Why?
Dialog boxes can contain several user interface tools: text messages, drop down menus, and input fields. Many dialog boxes require choices or input from the user on several lines before closing down the box. We use the ENTER key to close down the box. So, for both drop down menus and input

fields there is a 2 level use of the ENTER key. When inside a drop down menu, the ENTER key can be used to make a selection in that menu without closing down the box. In an input field, ENTER has 2 levels of use also. When your typing is finished, ENTER will simply high light the text without closing down the box. The second ENTER press from either a drop down menu or an input field will close down the entire dialog box.

min() function - why does it not work on strings?
The min() function was designed to work on two numeric expressions, two lists, two matrices, or a single list or matrix.

    define minstrng (str1, str2) = when (str1 < str2, str1, str2)

defines a function that returns the alphabetically lesser of two strings.

Pictures in TI-92 Toolbars
You can use a picture as a Toolbar title only if the picture has dimensions of 16 x16 pixels.

Use "StoPic picVar [, pxlRow, pxlCol] [, width, height]" to define the picture.

Phase Planes on the TI-92
The 92 can do phase planes in sequence graphing mode. It is a sequence plot where you show one function vs. another function.

Differential equation phase planes are not possible on the TI-92.

Verifying a symbolic result
When a symbolic result is different than what you expected you can use several tools in the TI-92 to help verify that the result is equivalent:

- Try subtracting the result from the expected result to see if simplifies to zero.
- Try graphing the result you expected and the result you got from the TI-92.
- Try using some of the manipulation features like expand(), factor(), comDenom(), etc. to see if you can force further simplification of either result or better yet, their difference.
- Try substituting appropriate random values for some or all of the variables in each of the two expressions.

d() (symbolic differentiate) algorithm
d() repeatedly uses the chain rule together with the well-known formulas for the derivatives of sums, products, sinusoids, etc.

I can't get my cover (snap cover) off. How do I get it off?
Pull back on one corner of the cover, "burp it like Tupperware" and the cover should come off.

How is the application-specific 68000 different from a regular 68000?
It's a 68000 with:

- Low-power static capability.
- The application specific is our logic we tie around the 68000 to allow us to have our choice features like low battery detect, extra avoid memory-loss circuitry, talk to our LCD, keyboard, etc...

Graphing and Geometry screens differ by one pixel each way - why?
In function graphing, it is very important to teachers that the origin pixel be at (0,0) when abs(xmin) = xmax (e.g., -10 to 10). So, we had to make the screen an odd number of pixels high and wide. This was a change made from the TI-81 to the TI-82 and has stuck on subsequent products.

On the Geometry screen, it is not as important that the default window be symmetrical since the user changes the window interactively, instead of on a menu. We shifted the origin one pixel to have it at (0,0) and simply did not delete the rightmost column of pixels. The default window is from -4.148 to +4.103 in the x direction.

Implied multiplication-x[space](a+b) is not read as multiplication?
The only significance that the parser gives to white space is that it terminates tokens. Thus, abcd is a single name, but ab cd are two separate names, because the space caused the name parsing algorithm to stop after the b.

Spaces do not directly create implied multiplication. Implied multiplication occurs when two valid factors are found in succession without any other binary operator between them. When the next non-blank following a valid name is a left parenthesis, the name is assumed to be a function/program reference.

Limiting the glare off the screen in classrooms
Try adjusting the display contrast using [diamond] [+] to darken the display or [diamond] [-] to lighten the display.

Hold the unit at a different angle to change what is being reflected in the display.

We used this type of display to increase the the brightness of the pixels in the display.

Integration - why is a numeric answer returned when I expected symbolic?
If you entered an integration problem and received a numeric answer when you expected a symbolic one, there are a couple of reasons.

First, see if the variable you are integrating with respect to has a value stored to it (i.e. X has a value of 5). If it does, you will need to delete that variable or use a different one. You can delete the variable by pressing F6, Enter from the home screen or by using the DelVar command.

If the variable did not have a value stored to it, the TI-92 may have resorted to a numerical approach to find the solution for the problem. This could happen when the problem you are solving is too 'complex' for the symbolic algorithm to solve.

Menu options are fuzzy - Why?
Some of the commands are not accessible from all screens or modes. If a command appears unreadable, it means that particular command line is unaccessable from the current mode. It will be available from a different screen or application.

tCollect() (trig collect) function algorithm
tCollect() repeatedly uses the well-known formulas for products and integer powers of sines and cosines, such as those given in the CRC tables.

tExpand() (trig expand) function algorithm
tExpand() repeatedly uses the well-known formulas for the sine and cosine of multiple angles, angle sums and angle differences, such as those given in the CRC tables.

Trig functions return unexpected answers in DEG mode - why?
Internally, the trig functions always convert to radian measure. DEG (degree) mode simply multiplies trigonometric arguments by pi/180 before proceeding with simplification.

Thus depending on the arithmetic mode (EXACT, APPROX or AUTO) and whether or not the trigonometric argument contains floating-point constants, you might see pi/180 in a result.

View the name of the variable currently in any editor
You can view the name of a variable currently in an editor of the TI-92. From inside any of the editors (Text,Program,Data/matrix,Geometry) go to the Save As dialog box (under the F1tools pull down menu) and see the name of the variable in the title of the dialog box.

ViewScreen connector - does every TI-92 have it?
All TI-92s sold in the United States** will have the ViewScreen connector.

We have heard from teachers for a very long time how nice it would be to have each calculator drive a ViewScreen. Since the TI-92 ViewScreen electrical system is designed into every TI-92 unit, we only had to add the connector to make each TI-92 ViewScreen capable.

This will allow students to easily show something to the class on the teacher's remote display panel. It will also allow teachers to purchase a TI-92 for evaluation and easily upgrade to the ViewScreen capability later.

**TI-92s sold in Europe come in two versions - the regular TI-92 and the TI-92 ViewScreen compatible calculator.

What is under the little screwed in cover plate under the back case?
This is where the back up battery is stored.

When doesn't work as expected in a data variable - why?
The when comparison doesn't work as some people would expect. If you are trying to test each element in a column to determine which element is entered in another column, you will need to use the following:

```
seq(when(c1[e]>X, 1,2,3),e,1,dim[c1])
```

You have to 'force' the when to compare each element by placing it within a sequence.

Why does 4^x get simplified into 2^{2x}?
Bases are factored into primes to help recognize cancellations. For example,

$$\frac{6^x}{4^x} \Rightarrow \frac{2^x 3^x}{2^{2x}} \Rightarrow \frac{3^x}{2^{2x-x}} \Rightarrow \frac{3^x}{2^x} \Rightarrow \left(\frac{3}{2}\right)^x$$

Why, when I enter solve (sin(x)=0,x) do I get x=@n1*pi? (TI-92)
This equation has an infinite number of points where sin(x)=0. For example, sin(pi)=0, sin(2*pi)=0, sin(3*pi)=0 and so on...

The TI-92 is showing that this equation has this infinite set of solutions by displaying @n1*pi. The integer suffix of "@n" increases for successive problems, then wraps back to 1 after 255.

Think of "@n" as denoting "@rbitrary iNteger".

zeros() function algorithm

zeros(expr,var) is expr>list(solve(expr=0,var),var)

Texas Instruments FAQ for the TI-92 Plus

http://education.ti.com/product/tech/92p/faqs/faqs.html

- What types of 1st- and 2nd-order Ordinary Differential Equations will the TI-92 Plus solve symbolically?
- What types of Systems of Equations can be solved using the TI-92 Plus?
- What is Advanced Mathematics Software?
- How much memory does the TI-92 Plus have?
- Are there any engineering applications for the TI-92 Plus?
- Is user data archive memory erased by reset?
- Are the TI-92 and TI-92 Plus compatible? What CANNOT be shared between the TI-92 and the TI-92 Plus?
- Is the TI-92 Plus allowed on College Board tests (SAT, ACT)?
- Are there any support materials or workbooks for the TI-92 Plus?
- What are the appropriate courses for the TI-92 Plus?
- How much do the AMS upgrades for the TI-92 Plus cost?
- Is Texas Instruments still selling the TI-92 Plus Module?
- Does the TI-92 Plus use the same ViewScreen as the TI-92?
- What Data Collection tools is the TI-92 Plus compatible with?
- What are the main differences between the TI-92 and TI-92 Plus?
- How much does the TI-92 Plus cost?
- What do Flash and electronically upgradable mean?
- Does the TI-92 Plus work with the TI-Graph Link?

What types of 1st- and 2nd-order Ordinary Differential Equations will the TI-92 Plus solve symbolically?

1st Order: separable, linear, Bernoulli, y'=f(a*x+b*y), exact, integrating factor independent of x, integrating factor independent of y, and homogeneous.

2nd Order: linear constant coefficient (and a few variable coefficient), missing y, missing y', missing x, missing both y' and x.

What types of Systems of Equations can be solved using the TI-92 Plus?

solve(...) and cSolve(...) return real or complex solutions of linear or nonlinear systems of equations. For linear or polynomial systems, they use the Gaussian or Groebner elimination method to seek all solutions. Otherwise, they use a damped-Newton/steepest-descent method to seek an approximate solution close to the user's guess, which defaults to 0.0 for each component.

What is Advanced Mathematics Software?

Advanced Mathematics Software is the name of the software features available on the TI-92 Plus. Features of Advanced Mathematics Software are:

- Symbolic Differential Equation Solving
- Numeric Differential Equation Graphing
- Additional Linear Algebra, e.g. eigenvalues, eigenvectors, functions of matrices, LU and QR decompositions

- 3D Rotation and Contour Plots
- Systems of Equations Solving
- Units of Measure
- Interactive Numeric Solver
- Expanded Statistics features, like Sine and Logistic Regression models, and a Modified Box Plot
- Geometry Enhancements - Check Properties for Member and Equidistant, and expanded Redefinition tool
- Languages in Geometry - menus and messages in English, Spanish, Italian, French and German.
- Assembly language programming
- Hexadecimal and binary operations and conversions
- Function definition and evaluation with the same variable, and function compositions. (Circular Definition Error issue)
- BldData command to make graphical data available as a data variable (multiple lists) for statistical modeling or further analysis.
- isPrime function for finding prime numbers, and improved integer factoring
- Improvements to Polar/Degree mode for complex numbers
- Resizing matrices from the Data/Matrix Editor
- Implicit Plots via the 3D grapher

How much memory does the TI-92 Plus have?
The TI-92 Plus provides two types of additional memory: RAM and user data archive memory. The user available RAM is about 188K and can be used for computations and storing programs and data. The user data archive has 384K of available space for storing additional programs and data.

Are there any engineering applications for the TI-92 Plus?
Yes. Currently there are three Flash Applications regarding engineering:

1). EE200
Designed primarily for 1st-year and 2nd-year college students in circuit analysis coursework, EE200 is an educational tool. It requires students to know in advance relationships between variables, units appropriate to a particular problem and formulae to express units and their relationships. In using the many advantages of EE200, students can:

- Avoid math and units errors
- View the units appropriate to inputs and solutions
- Convert automatically between units
- Augment the TI calculators' 125 built-in units in 27 categories with 145 more units and 25 additional
- Unit-categories relevant to Electrical Engineering
- Save formulae and answers from homework or exam questions to check work later
- Use ordinary language and notation in developing formulae and units to solve problems
- Be alerted in advanced to incorrect, unbalanced formulae and units
- Import equation sets from da Vinci Technologies' EE-Pro

And more

2). ME*Pro
Helps solve a comprehensive set of equations used by mechanical engineering students and professionals. With a power browser engine and unit manager, it covers over 1000 equations (with 100 pictures) covered in 12 subjects such as Heat Transfer, Strength of Materials, Machine Design, Refrigeration, Pumps, Waves and Oscillations, Fluid Mechanics and Gas Laws. 57 analytical routines

solve topics such as Steam Tables, Thermocouples, Section Properties and Efflux. An interactive reference table provides data tables for refrigerants, water properties, Laplace and Fourier Transforms, and fuels and combustion properties.

3). EE*Pro
Is organized into three convenient sections of Analysis, Equations and Reference useful to solve problems encountered by students and professionals of Electrical Engineering. The user interface is menu driven showing the basic organization into topics and sub-topics. The equation section has over 700 equations while the reference section gives access to data commonly needed by practicing professionals.

Is user data archive memory erased by reset?
Reset affects the user data archive memory just like it does RAM. All data stored in the TI-92 Plus will be erased when you reset the unit (with either the Memory, F1, Reset or the Lock + 2nd + On key sequences).

Are the TI-92 and TI-92 Plus compatible?
What CANNOT be shared between the TI-92 and the TI-92 Plus?
If original TI-92-specific files are created on the TI-92 Plus and sent to a TI-92, they should run in many cases (including PIC files, text files, strings and Geometry Figures and Macros). Exceptions could be user-defined programs (especially symbolic programs) and functions, GDB's (graph databases), sysdata, and other system variables, and data variable datatypes. Also, lists, matrices and data variables that are strictly numeric data should transfer between platforms.

Is the TI-92 Plus allowed on College Board tests (SAT, ACT)?
The TI-92 Plus is not allowed on standardized tests.

Are there any support materials or workbooks for the TI-92 Plus?
You can find a listing of support materials for the TI-92 Plus at the following URL.
http://education.ti.com/product/book/colbooks.html

What are the appropriate courses for the TI-92 Plus?
The Advanced Mathematics Software of the TI-92 Plus makes it a useful tool for Calculus I - Calculus III, Linear/Matrix Algebra, and Differential Equations. Of course, the TI-92 Plus can also be used for Algebra, Geometry, and High School math courses, due to the existing TI-92 functionality.

How much do the AMS upgrades for the TI-92 Plus cost?
Advanced Mathematics Software upgrades for the TI-92 Plus are available from Texas Instruments at no charge.

Is Texas Instruments still selling the TI-92 Plus Module?
No. Texas Instruments is no longer selling the TI-92 Plus Module.

Does the TI-92 Plus use the same ViewScreen as the TI-92?
Yes. The TI-92 ViewScreen will work with the TI-92 Plus.

What Data Collection tools is the TI-92 Plus compatible with?
The TI-92 Plus is compatible with the CBL, CBL2 and the CBR.

What are the main differences between the TI-92 and TI-92 Plus?
The TI-92 Plus has Advanced Mathematics Software, additional memory, and upgradability.

How much does the TI-92 Plus cost?
Please contact your Instructional Products Dealer for pricing information:
http://education.ti.com/global/dealers.html

What do Flash and electronically upgradable mean?
Flash is a technology that allows the calculators software to be upgraded electronically. Using the TI-GRAPH LINK cable and the link I/O port, the software can be updated with the latest maintenance updates or new software versions.

Does the TI-92 Plus work with the TI-Graph Link?
Yes, the TI-92 Plus is compatible with TI-Graph Link cables.

Texas Instruments GraphLink FAQ

http://education.ti.com/product/accessory/link/faqs/faqs.html

- Build my own link cable?
- Extra spaces in front of each program line - why?
- File size limitations - why can large files from my calculator not be opened?
- Graph Link (DOS) interferes with my mouse or other serial card.
- I cannot open a "protected" TI-82 program using my Mac Graph Link.
- Inserting lists into (exporting from) an Excel™ spreadsheet.
- Installing Graph Link fonts on my Mac
- Mac 5400 will not work with Graph Link - what to do.
- Macintosh PowerBooks and Graph Link - does it work?
- New or Updated Graph Link software - where can I get it?
- Power drained from the calculator by the cable?
- Can I use a Printer port instead of Modem port on Macintosh?
- Site license for the TI-GRAPH LINK?
- StudyWorks™ - how does it work with the Graph Link?
- System requirements for the Graph Link.
- Transmission errors with Graph Link (Mac version).
- Transmission errors with Graph Link (PC version).
- Why can't I open an edit-locked program using my Graph Link?
- Can I connect my Graph-Link to my iMac, or other Macintosh computers that have USB ports?
- Does the TI-Graph Link USB work with the TI-82 or TI-85?

Build my own link cable?
Questions have been asked frequently about the cost of the cable to link between personal computers and TI Graphics Calculators. A number of people have wanted details to build their own cable, perceiving it to be merely a matter of matching the RS-232 port TX and RX lines to the proper pins on the calculator plug.

Texas Instruments wants the interconnection of the Graphics Calculator to other devices to be as simple and cost effective as possible. For this reason, the link port on the calculator is not designed like RS-232. A RS-232 type port requires accurate timing and involves circuitry that consumes significant power. The calculator's link ports have two data lines and a ground, using simple CMOS digital levels in a self clocking protocol that does not require any precise timing, but can operate well above 9600 bits per second. This allows the linking between two calculators to be accomplished at minimal cost and power drain.

In line with this strategy, our first link cable (the black one (*should be 'the gray one', Ed.*)), utilized relatively simple transistor circuitry and did not even use the RX and TX lines of the RS-232 port. Instead, it used the RS-232 "control" lines (2 for inputs and 2 for outputs) to operate the data lines. The reason we had to change away from this approach is that many Macintosh computers do not have all the necessary control lines available on their serial port connections. To make a MAC compatible connection we had to communicate through RX and TX and this required putting an eight-bit, crystal controlled oscillator, PIC microcontroller in the cable. This microcontroller communicates with the PC at a standard baud rate and converts each bit into the self clocking protocol to communicate to the calculator. The power for the cable is derived from the PC and doesn't impose significant drain from the calculator. Overall, this approach provides a reasonable cost link without any cost burden to the calculator user who does not use a link to personal computers.

Due to the specialized components and also because some parts of the design are necessary to ensure compliance with FCC radio frequency emission regulations, it is not practical for individual users to build their own cables on a general basis. We hope this explanation helps you understand why this is.

Extra spaces in front of each program line - why?
When you try to "Open" a group file on a Macintosh, you will receive an Information Window which shows all lines of each program inside the group file. If you copy this and paste it into a new program, you will see three extra spaces at the beginning of each line. To avoid these spaces, "Ungroup" the group file instead of Opening it.

File size limitations - why can large files from my calculator not be opened?
Part of the difficulty here is tokenized size vs text size. The maximum 'text' size for editing (in the TI-82 and TI-83 software) is about 32k bytes. Tokenization reduces the size to much less (probably ~22k). What this means is that keywords like 'Then', 'Disp', 'PlotsOn', etc. are 1 or 2 bytes tokenized vs 4 or more in 'text'.

If you have a 23k program on your calculator in tokenized form (i.e. you created it on your calculator), and then attempt to edit this using the Graph-Link, the editable text image probably exceeds the 32k text edit limit. Basically, this large of a program is un-editable with Graph Link.

The workaround is not an easy one. The program has to be split into smaller segments (subprograms) and each one edited separately.

Graph Link (DOS) interferes with my mouse or other serial card.
Graph Link works with the IBM standard communications protocols. Com1 and Com3 share an interrupt request (IRQ), and Com2 and Com4 share an IRQ. Com1 and Com3 use IRQ 4 while Com2 and Com4 use IRQ 3.

Example: If you have a mouse on Com1 and have the mouse driver software loaded, you will have trouble running Graph Link on Com3. Network cards can also cause such problems. You will need to eliminate the IRQ conflict to have both devices working at the same time.

I cannot open a "protected" TI-82 program using my Mac Graph Link.
The older version of the Graph Link software for Macintosh would not allow users to read or update a protected TI-82 program once it is saved. The new version of the Mac software has changed this feature. Now, users can protect a program to be sent to the TI-82, but the user can still read and update these programs from their computer.

The new software is now included in the Graph Link package.

Inserting lists into (exporting from) an Excel™ spreadsheet.
You can import data from an Excel spreadsheet by the following procedure. In Excel, open the file that contains the data you wish to export. Select File, Save As... and choose Text (Tab Delimited) from the "Save File as Type" box. You will select the directory and give the file a name. Then go to the Graph Link software.

In the TI-82 Graph Link software, go to File, Utilities, Import ASCII Data File. Select List and one of the list names. Now you need to find and select the file you saved earlier. After you select OK, you will be asked for a name for the new list file (you can just use the default name). Select OK again and the file will be saved as a TI-82 list. You can then go to File, Open and see the file or simply download it to your calculator. (The process is very similar in the other Graph Link software. In the TI-83, TI-86, and TI-92, you will find the Import option under Tools.)

You can export data from a TI-82 list to an Excel spreadsheet in a couple of ways. First you can open the list in the Graph Link software and select all the elements. (Edit, Select All) You can then Copy and Paste it into the Excel spreadsheet. You can also export the information using the Export Data File under File, Utilities. This procedure is very similar to the importing above.

Installing Graph Link fonts on my Mac
If you are running system 6.* then you will need a font mover (font D/A mover) which opens your SYSTEM FILE and places the fonts in it. This Font D/A Mover is a Mac utility usually found on the TIDBITS disk that came with the Mac.

If you are running system 7.* simply drag the fonts from the Graph Link disk to a closed SYSTEM FOLDER. The Mac should then automatically move the fonts to the users SYSTEM FILE or FONTS FOLDER (depending on the version of system 7 software).

Mac 5400 will not work with Graph Link - what to do.
The Graph Link draws power from the serial port, which is different from most serial devices. This appears to be causing a problem with the Mac 5400's. To correct the problem, you will need to unplug the Graph Link cable, reboot the computer and plug the cable in after the computer starts.

Macintosh PowerBooks and Graph Link - does it work?
Yes, the Graph Link will work with the Macintosh PowerBooks.

The difficulty is that PowerBooks have multiple functionality on a single comm port. The Graph Link will not re-configure system settings, controlled from Control Panels or Chooser.

To get Graph Link to work with a PowerBook (as noted in the Link85.user and Link82.user files in the FREEWARE folder) you need to:

- Disable AppleTalk/LocalTalk from the Chooser.
- Launch the 'Portable' control panel, disable the internal modem, and enable the external modem.

After making the above changes, launch the Graph Link application. Graph Link will now communicate with the link hardware/calculator, since the "printer port" is now a "modem port".

New or Updated Graph Link software - where can I get it?
Software for new models of calculators is made available through the WWW in beta test form during software development.

When development is complete, it is included in the TI-GRAPH LINK package. New software becomes available free through the WWW after release, and is also available on diskette in the U.S. and Canada from our TI at 800-TI-CARES. There is a charge for ordering the software from TI to cover handling costs.

Power drained from the calculator by the cable?

If the Graph Link cable is plugged into the calculator and not to the computer, it will drain power from the calculator. If the Graph Link cable is plugged into the calculator and computer but the Graph Link software is not running, the cable will also drain power from the calculator.

The Graph Link cable gets power through the DTR line of the serial port. However, it is normally off and the Graph Link software turns it on. Therefore, you should plug the cable into the calculator after the cable is attached to the computer and the software is running.

Can I use a Printer port instead of Modem port on Macintosh?

The TI-82 and TI-85 Macintosh Graph Link software has been updated to allow a user to download programs with the Printer port, as well as the Modem port (like the TI-92, TI-86, and TI-83 software). Users that need this option can download updated software.

Site license for the TI-GRAPH LINK?

A site license is not needed to put the software on several computers. The software that comes with the TI-GRAPH LINK may be installed on several computers as needed. Of course, a Graph Link cable is needed to communicate with a calculator. One cable may be moved from computer to computer as needed.

StudyWorks™ - how does it work with the Graph Link?

Steps to use the Graph Link with StudyWorks:

- Upload a list (or matrix) to computer via the Graph Link.
- Export list from Graph Link into an ASCII data file (*.PRN). (You will need to save it in the same directory as your StudyWorks file is located.)
- "READ" ASCII data file into StudyWorks worksheet ()

System requirements for the Graph Link.

The different system requirements for DOS, Windows and Mac can be found in the features zone.

Transmission errors with Graph Link (Mac version).

If you are receiving Tranmission Errors when using Graph Link, check the following:

- Ensure that the cable is pushed all the way into the calculator (This is probably the most common difficulty, and easily overlooked).
- Check that your computer meets Graph Link's system requirements.
- Ensure that you are plugged into the same communications port that you have set in the Graph Link Preferences (modem or printer)
- Try restarting your Mac with the Extensions turned OFF, as some extensions may cause conflicts with the port. You can do this by pressing and holding the SHIFT key while the Mac is restarting. If this solves the problem, then restart the extensions one by one until the problem one is found.
- If you are using the modem port, make sure the external modem is turned ON.
- Turn Appletalk OFF (Appletalk can be accessed by going to the Apple menu and selecting "Chooser".

Transmission errors with Graph Link (PC version).

If you are receiving Tranmission Errors when using Graph Link, check the following...

DOS:

- Ensure that the cable is pushed all the way into the calculator (This is probably the most common difficulty, and easily overlooked).
- Check that your computer meets Graph Link's system requirements.
- If you use a notebook computer, make sure the port you are using is turned ON. Secondly, try using Graph Link with the battery savings turned off. These battery conservation mechanisms often create difficulties with Graph Link.
- Ensure that the COM port that the cable is plugged into and the COM port selected in Setup match.
- If you have a mouse and mouse driver, they may be causing an IRQ (interrupt request) conflict with Graph Link. Try rebooting the computer with out the mouse and/or mouse driver loaded.
- Ensure that you do not have a device conflict, such as an internal modem using the same COM port that the Graph Link is using.
- Ensure that the IRQ for COM1 & COM3 is set to IRQ 4, and COM2 & COM4 are set to IRQ 3. (Graph Link requires these settings, while other serial devices might not.)
- With DOS 6.0 and higher, try rebooting the computer bypassing the autoexec.bat and config.sys by pressing F5 when computer says "starting MS-DOS".

Windows:

- Check the first 6 bullets above.
- Check that your computer meets Graph Link's system requirements.
- Make sure Windows has not changed the condition of the COM ports.
- For example, the DOS version may work while the Windows version does not. Windows port setting under the Control Panel could have changed the com port setups.
- Check the Startup group to see if any additional programs are being loaded along with Windows that might interfere with serial communication.

Why can't I open an edit-locked program using my Graph Link?
In order to open a write-protected program, you must have version 1.1 or later of the Macintosh software which allows you to edit-lock a program. To determine the version of the Macintosh software, you can click and hold the Apple symbol and then click on About TI-GRAPH LINK. If you have an early version of the software, you will need to get a newer version.

Note: The Windows software has always allowed users to update a protected 82 program.
The TI-83, TI-86, and TI-92 softwares have had this feature from the beginning as well.

Can I connect my Graph-Link to my iMac, or other Macintosh computers that have USB ports?
Yes. You can purchase a TI-GRAPH LINK USB cable to connect your TI graphing calculator to a Macintosh USB port. To place an order via phone, call 1-800-842-2737. You can also place an order through our online store.

You can connect the Gray TI-GRAPH LINK cable to a Macintosh USB port by using a USB to serial adapter.

USB-to-Serial adapters are available on the WWW. For more information on USB-to-Serial adapters you can visit the following web sites:

http://www.keyspan.com/
http://www.usbstuff.com/
http://www.entrega.com

http://www.belkin.com

NOTE

Texas Instruments has not tested the adapters supplied by these companies. Some TI-Graph Link users are reporting success in using some of these adapters. However, we do not make any claim that they will work with your calculator or that their use will not damage your calculator. USE AT YOUR OWN RISK.

Does the TI-Graph Link USB work with the TI-82 or TI-85?
No. The TI-Graph Link USB does not work with the TI-82 or TI-85. You can connect the Gray TI-GRAPH LINK cable to a Macintosh USB port by using a USB to serial adapter.

USB-to-Serial adapters are available on the WWW. For more information on USB-to-Serial adapters you can visit the following web sites:

http://www.keyspan.com/
http://www.usbstuff.com/
http://www.entrega.com
http://www.belkin.com

[B.2] TI documentation

In a web page redesign in March 2001, TI has evidently removed the *EightySomething* newletters. I have a few of the old ones; email me if you would like a copy.

TI calculator manuals, called guidebooks, are available on-line. These are the links to download the manuals:

TI-92 guidebook:
http://education.ti.com/product/tech/92/guide/92guideus.html

TI-92 Plus module guidebook:
(no longer available; use the 89/92+ guidebook)

TI-89 guidebook:
(no longer available; use the 89/92+ guidebook)

Combined TI-89/TI-92 Plus, AMS 2.05
http://education.ti.com/product/tech/92p/guide/guides.html

TI GraphLink guidebook:
http://education.ti.com/product/accessory/link/guide/guides.html

[B.3] Web sites

There are thousands of independent TI calculator web sites. These are the best. In my opinion, of course.

Visual Mathematics Illustrated by the TI-92 and the TI-89

http://www.imaxx.net/~gdorner/visual/

http://206.67.72.201/catalog/np/feb00np/2-287-59685-2.html

These two sites describe an excellent mathematics book written by George Dorner, Jean Michel Ferrard, and Henri Lemberg, and published by Springer-Verlag. As far as I know, this is the only 'advanced' mathematics book for the 89/92+. From the description:

> *Here is a selection of basic and advanced mathematics, unified by common themes and supported by graphical and formal calculations provided by the TI-92, the TI-92 Plus, and the TI-89 graphing calculators.*
>
> *The topics of mathmatics covered are those of higher level university courses for students of mathematics, computer science, physics, engineering and other sciences...*
>
> *Topics covered are in the fields of classical analysis and linear algebra, and in the overlap of the two. Chapters are devoted to discrete dynamical systems, differential equations, Fourier series, and approximation and interpolation theory.*

This book is expensive, but worth it. If you don't care to buy it for yourself, you could ask your school or local library to purchase it. It is a thorough, involving and accessible introduction to many fascinating and useful areas of mathematics.

Stephen Byrne's List of TI sites

http://www.rit.edu/~smb3297/ti/

A nice list of TI oriented sites categorized by math and engineering topics.

Olivier Miclo's ti-cas site

http://www.ti-cas.org/

One of the premium math sites. Emphasis on calculus, trigonometry, matrices and polynomials. Too much good stuff for me to summarize!

Roberto Perez-Franco's Symbulator site

http://sq.calc.org

Here you can get the most powerful programs available for the 89/92+. Symbulator; a symbolic circuit simulation program. Diffeq; Lars Frederiksen's differential equation solver, includes solutions to multiple differential equations. Advanced LaPlace: another solid piece of work by Lars which solves for LaPlace transforms and inverses. Also: Fourier transform programs, state space program, discrete Fourier transform and inverse. You can also get Lars' RPN program here, which implements an RPN interface for the HW1 89/92+.

S.L. Hollis' TI-89/92 math site

http://www.math.armstrong.edu/ti92/

Lots of very good math programs. Single and multi-variable calculus, linear algebra, differential equations, probability, Gaussian quadrature and special functions. Very, Very Good Site!

Frank Westlake's site

http://frank.westlake.org/ti/

Several calculus functions, including directional derivative, gradient, partial and total derivatives, multivariable limits, Taylor approximations for multi-variable functions. Notes on using Var-Link to provide fast program and function documentation. Internet sockets to send and receive email with your calculator. Number base conversions. Roman numeral conversions. Image editor. Remote control with scripts. Lots of utilities for converting text files, including BMP, RTF, PIC, TEXT and STR formats. You must disable Javascript in your web browser to use Frank's site.

Jack Hanna's Iview site

http://users.bergen.org/~tejohhan/iview.html

Get Jack Hanna's *Iview* program here. The program runs on a PC and converts graphics files to PIC variables which can be viewed and manipulated on the calculator.

Rusty Wagner's site

http://rusty.acz.org/

Go here for the Virtual TI emulator (VTI). This is PC software that emulates the calculator. You'll need to do a ROM dump from your calculator to run it. 'ROM dump' means uploading the calculator ROM image to the PC with a GraphLink cable. ROM images are not legally available by any other means.

The advantage to using the emulator is that you can test programs before downloading them to your calculator. This can save battery life.

Techno-Plaza

http://www.technoplaza.net/

A very complete comparision between the TI-89 and the HP49G, with little or no bias. Some math programs. Good assembly programming tutorials.

SoftWarehouse advanced functions

ftp://ftp.ti.com/pub/graph-ti/calc-apps/92/swh/

Advanced math functions for the 89/92+. Although this was written for the original TI92, and many of these functions are now built into the 89/92+, there is still lots of good stuff here. In particular, the code style is clever and efficient - you can learn a lot about programming by examining these programs.

TI redesigned the web site in March 2001. The little remaining description of this function packages is at *http://education.ti.com/product/tech/92/faqs/faq20595.html*

TI calculator program archives

http://education.ti.com/student/coll/down/archive.html

Programs written by users and submitted to TI. Includes the inferential statistics package for the 89/92+.

TI 89 Users Group - TAMUK math club

http://www.tamuk.edu/mathclub/

This is another top-tier site. Lots of math programs in all the usual categories, but also other programs in science, engineering and CBL/CBR. Does not appear to accept submissions right now. Some programs are original, some have been collected from other sources, and modified for various reasons.

Bhuvanesh Bhatt's site

http://triton.towson.edu/~bbhatt1/ti/

Several TI-92 PLUS advanced math programs, including: Cauchy principal value of an integral, a differential equation graphing utility, a multiple linear regression function, a special functions package, a tensor analysis package, a Christoffel symbol package, and a complex analysis graphing package. Bhuvanesh also has a special functions package that implements a great many special functions. You can also get E.W.'s 89/92+ EquationWriter (EQW) here. This site also hosts this tip list.

Stuart Dawson's surverying software

http://www.dawson-eng.demon.co.uk/nexus/

Surveying software for working surveyors. The more powerful versions are *not* free, but there is a free version with reduced functionality.

Andrew Cacovean's tip list & examples site

http://www.geocities.com/TI_TipList/

Andrew hosts the web version of this tiplist, and you can also get the current version of the 89/92+ wishlist there. Andrew also has some very good tutorials on using the 89/92+ to solve basic and more advanced problems.

Kevin Kofler's web site

http://ti89prog.kevinkofler.cjb.net/

This is where to go to get Kevin's extremely handy *autoaoff()* program, which disables the default alpha keyboard in dialog boxes on the TI-89. Kevin has also written programs to automatically close open parentheses on the entry line, map common functions to unused key combinations on the TI-89, balance chemistry equations, use log and semi-log axes on function plots, find exact solutions to cubic and quartic equations, make date calculations, manipulate grey-scale pictures and display calendars.

Paul Pollack's TI-92 Number theory programs

http://www.geocities.com/Hollywood/2979/ntheory.html

A small collection of number theory programs, including tests for primality, tests for probable primality, factoring by Pollards rho method and p-1 method, and fast square roots of large integers. Seems to be old but still useful.

Michael Lloyds TI calculator programs

http://www.hsu.edu/faculty/lloydm/ti/prgmtabl.html

This site includes many programs in algebra, trigonometry, statistics and calculus. Some specific programs include Molleweide's equation for checking triangles, conic equation graphing, probability distributions (binomial, F, Pearson-Moment correlation, Student's T, chi-squared), ANOVA and number base conversions.

Bubu's TI-92 programs

http://www.multimania.com/bubuw/index_e.html

Only one program on this site, an implementation of Conway's 'game of life' cellular automata simulator. What makes this notable is a large collection of 'starting patterns' for the simulation.

[B.4] Bibliography of TI-89 and TI-92 Plus books

This bibliography lists books related to the TI-89, TI-92 or TI-92 Plus calculators. Some are out of print, but you may find them at used book stores or web sites, or on eBay. Many of these books are little more than (very) expensive pamphlets: make sure you know what you're getting before you buy them.

For some of the books I give contents and excerpts from prefaces or introductions, to give you a better idea of what the book is about. If given, prices are in US dollars as of May, 2002.

The last section of the bibliography lists general calculator books not specifically related to TI calculators, but they may be interesting or useful.

The bibliography is organized in these sections:

Introductory and programming
General Mathematics
Algebra
Calculus and differential equations
Statistics
Geometry
Engineering
CBL, CBR
Other calculator books

Introductory and programming

Getting Started with the TI-92/TI-92 Plus
Carl Swenson, Brian Hopkins, John Wiley and Sons, 1998

Graphing Calculators: Quick and Easy Using the TI-92 Plus
David P. Lawrence, Pencil Point Press, Inc., ISBN 1-881641-46-5

Great TI-92 Programs - Vol 1.
Bernhard Kutzler, David Stoutemeyer, Teachware Series, 1997, ISBN 3-901769-00-5

Introduction to the TI-89 (Part 1)
Bernhard Kutzler, Eric Armin Inc., ISBN 3-901769-14-5

Introduction to the TI-89 (Part 2)
Bernhard Kutzler, Eric Armin Inc., ISBN 3-901769-15-3

Introduction to the TI-92

Bernhard Kutzler, Eric Armin Inc., ISBN 3-901769-02-1

Learning Programming with the TI-92: Structures and Techniques
Steve Blasberg et al, Texas Instruments, 1997, ISBN 1-886309-08-6
(TI Explorations Series, High school and university, $22.50)

"In this book, we introduce many of the programming commands and functions of the TI-92. As you use this book to learn programming, you also will learn structured programming techniques that help you program efficiently in the TI-92 programming language and in other programming languages as well. These techniques will help you write well-documented programs that are easy to follow, modify, and maintain."
Contents: Introduction to the TI-92. The Action Block. Top-Down Programming. The Decision Block. The Repetition Block. Working with Data. Working with Parameters and Functions. Working with Menus and Dialog Boxes. Working with Graphics. Geometry on the TI-92. Solutions to Practice Problems. Index.

Quick and Easy Reference Guide
David P. Lawrence, Pencil Point Press Inc., ISBN 1-58108-033-6

General Mathematics

Discovering Math on the TI-92
Chris Brueningsen et al, Texas Instruments, 1996, ISBN 1-886309-05-1
(TI Explorations series, High school algebra through calculus, $16.00)

"The purpose of this workbook is to provide a tool for teachers as they first use the TI-92 and consider ways to incorporate this technology into their classrooms. Our goal is to provide innovative and practical examples of how to begin using the new features of the TI-92 in high school math classes. The workbook is designed to meet the needs of a wide variety of students. Accordingly, many different areas of mathematical content are covered, ranging from algebra to advanced calculus.

"The activities are written assuming the reader has no TI-92 knowledge. Easy-to-follow instructions with step-by-step keystrokes are included for every activity. The book is presented in worksheet format so students can record their answers as they work. Extensions and extra practices are included at the end of many exercises, allowing students to investigate advanced topics related to concepts presented in the activity."

Contents: Exploring the Unit Circle. Getting Down to Basics. Solving Systems of Equations. Using Linear Programming in Real Life. What Is a Linear Regression?. Warming Up to Heating Curves. Evaluating Rational Function. Figuring Areas. Graphing An Extra Dimension. Functioning on Your Own. Modeling Damped Motion. What is the Number "e"?

Exploring Precalculus Mathematics with the TI-89/TI-92/TI-92 Plus
Michael Schneider, Gilmar Publishing, ISBN 0-888808-04-7

Learning Mathematics Through the TI-92
William Lawrence, Philip Yorke, ISBN 0-86238-489-3

Mastering the TI-92: Explorations from Algebra through Calculus
Nelson Rich et al, Gilmar Press, ISBN 0-9626661-9-X

Visual Mathematics Using the TI-92 and TI-89
G.C. Dorner, J.M. Ferrard, H. Lemberg, 2000, Springer France Editions, 440pp, ISBN 2-287-59685-2

Contents: Discrete dynamical systems. Differential equations. Fourier analysis. Interpolation and approximation. Orthogonality. Eigenvalues and eigenvectors. Calculator guide. Bibliography. List of the programs. Symbols used in the book. Index.
(Highly recommended by DAB.)

Algebra

Advanced Algebra with the TI-89
Brendan Kelly, Brendan Kelly Publishing, ISBN 1-895997-12-7

Algebra 1 Explorations and Applications; Activities for TI-81, TI-82 and TI-92 Calculators
McDougal Little Publishing

Algebra 2 Explorations and Applications; Activities for TI-81, TI-82 and TI-92 Calculators
McDougal Little Publishing

Investigating Advanced Algebra with the TI-92
Brendan Kelly, Brendan Kelly Publishing, ISBN 1-895997-05-4

Skill and Practice Masters in Algebra Using the TI-89
David P. Lawrence, Pencil Point Press, Inc., ISBN 1-58108-041-7

Skill and Practice Masters in Algebra Using the TI-92
David P. Lawrence, Pencil Point Press, Inc., ISBN 1-881641-56-2

Solving Linear Equations with the TI-92
Bernard Kutzler, Eric Armin Inc., ISBN 3-901769-03-X

Solving Systems of Linear Equations with the TI-92
Bernard Kutzler, Eric Armin Inc., ISBN 3-901769-05-6

Calculus and Differential Equations

Advanced Placement Calculus with the TI-89
Ray Barton, John Diehl, Texas Instruments, 1999, ISBN 1-886309-27-2
(TI Explorations series, high school calculus, $16.00)

"This book presents an introduction to the numeric, graphic and analytic features of the TI-89. It is our hope that as teachers and students become familiar with these features, they will experience the same excitement all mathematicians feel when a new idea is discovered."

Contents: Functions, Graphs, and Limits. Differentiation. Applications of the Derivative. Integration. Riemann Sums and the Fundamental Theorem of Calculus. Applications of Integrals. Differential Equations and Slope Fields. Parametric, Vector, Polar, and 3D Functions. Infinite Sequences and Series. Appendices: TI-89 Keystrokes and Menus. Common Calculus Operations. Creating Scripts. Solutions to the Exercises. Index.

AP Calculus with the TI-89 Graphing Calculator
George Best, Richard Lux, Venture Publishing, 1999, ISBN 1-886018-25-1

Applied Calculus With Technology
Richard C. Weimer, Brooks/Cole Pub Co., 1998, 784pp, ISBN 0534354491, $86.36

From the publisher:
"Understanding that technology can be both a valuable tool and as an active companion in the learning of calculus, Weimer has produced a textbook that students-those majoring in business, management, economics, and the social, life and physical sciences-will appreciate for the way it helps guide them into the 21st century. Students are introduced to functions and associated preliminary algebraic material, and then are presented with basic concepts of differential calculus. The organization and careful introduction of material is designed to help even poorly prepared students succeed. This text is ideal for professors who wish to integrate DERIVE® or the TI-92 graphing calculator into the applied calculus course."

Contents:
1. Functions. 2. The Derivative. 3. Graphs and Applications of the Derivative. 4. The Derivative: More Properties. 5. Derivatives of Logarithmic and Exponential Functions. 6. The Integral. 7. Additional Integration Topics. 8. Calculus of Several Variables. Appendix A: Important Derive? Commands for IBM-PC's or PC Compatibles. Appendix B: Derive? for Windows, Version 4.02. Appendix C: TI-92. Answers to Odd-Numbered Exercises.

CalcLabs for the TI-92
Selwyn Hollis, Brooks/Cole Publishing, 1997/98, ISBN 0-534-34970-6
(Not found on Brooks/Cole web site)

CalcLabs With the TI-92 for Stewart's Calculus: Concepts and Contexts, Single Variable
Selwyn Hollis, Brooks/Cole Pub Co., 1997
(Not found on Brooks/Cole web site)

CalcLabs With the TI-92 for Stewart's Mulitvariable Calculus: Concepts and Contexts
Selwyn Hollis, Jeff Morgan, Brooks/Cole Pub Co., 1998
(Not found on Brooks/Cole web site)

Calculus TI 92 Lab Manual
Ron Larson, Houghton Mifflin College, ISBN 0-395-90062-X
(According the Houghton Mifflin web site, this product is available 'with' various calculus texts. Prices are given for Windows and Mac versions, so perhaps it is actually software or a PDF file - impossible to tell from the description)

Calculus with the TI-89
Brendan Kelly, Brendan Kelly Publishing, 1999, 96pp, ISBN 1-895997-13-5, $16.95

Exploring Calculus and Differential Equations with the TI-89/TI-92/TI-92 Plus
Michael Schneider, Gilmar Publishing, ISBN 1-888808-06-05

Insights into Calculus Using TI Calculators: 83 Plus, 86, 89, 92, and 92 Plus
Robert Smith, Roland Minton, McGraw-Hill Higher Education

Insights into Calculus Using TI Calculators :
83 Plus, 86, 89, 92, 92 Plus for Use With Calculus : Premiere
Robert T. Smith et al, McGraw Hill College Division

Introduction to the TI-92: 37 Experiments in Precalculus and Calculus
Charles Lund, Edwin Andersen, MathWare, ISBN 0-96223629-7-2

Investigating Calculus with the TI-92
Brendan Kelly, Brendan Kelly Publishing, ISBN 1-895997-07-0

Scripting Guide for the TI-92 and TI-92 Plus: PreCalculus and Calculus Applications
J. Douglas Childs, Texas Instruments, 1998, ISBN 1-886309-20-5
(TI Explorations series, High School and University Pre-Calculus and Calculus, $16.00)
"The TI-92 provides instructors with a broad array of new teaching options. You can de-emphasize algebraic manipulation and, at the same time, focus on more powerful methods of solving problems using mathematics and the TI-92. This guide is designed for instructors, but is also useful for students, since it contains scripts and activities for students. By reading sections of this guide, students can gain insights about learning mathematics that they would not obtain from textbooks. This guide can be a valuable resource for teaching and learning calculus and precalculus with the TI-92 Plus.

"This guide has several purposes:

- To present some ideas about how to use the TI-92 to do calculus and precalculus calculations and processes.
- To make instructors aware of this new scripting feature in computer algebra graphing calculators.
- To describe a large number of learning activities for students. I recommend that you modify the scripts and activities to suit the needs of your students and your particular situation.
- To help mathematics instructors develop a pattern for using this somewhat complicated machine in a minimally obtrusive way.
- To help instructors think about what their students are actually learning and to provide an environment that may suggest some alternative instructional goals.
- To help students effectively use a TI-92 to learn and to do calculus and precalculus.

"Remember that this guide is designed to provide ideas and an opportunity to make improvements in your calculus course. Tools like the TI-92 will eventually change the way students learn mathematics - how and when this actually occurs is up to you. This guide is more of a beginning than an end. Most scripts and activities need to be modified by individual instructors to achieve their particular goals."

Contents: Getting Started with Scripts. Foundations. Functions. Applications. Limits. Derivatives. Integrals. Sequences and Series. Differential Equations. MultiVariable Calculus. Appendix.

Skill and Practice Masters in Calculus Using the TI-89
David P. Lawrence, Pencil Point Press, Inc., ISBN 1-58108-040-9

Skill and Practice Masters in Calculus Using the TI-92
David P. Lawrence, Pencil Point Press, Inc., ISBN 1-881641-91-2

Teachware Series, Support in Learning:
Optimization - Graphically, Numerically and Symbolically with the TI-92
ISBN 3-901769-20-X

Ti-92 Lab Manual for Calculus
Ron Larson, John Musser, Houghton Mifflin College

Statistics

Advanced Placement Statistics with the TI-89
Extensions for Advanced Placement Statistics with the TI-89
Larry Morgan, Roseanne Hofmann, Charles Hofmann, Texas Instruments, 2001

PDF format. This books uses the *Statistics with List Editor* Flash Application
(TI Explorations series, $22.50, *Extensions*: $9.00)

"With the help of the Statistics with List Editor Application, the TI-89 brings to life topics in statistics such as: histograms, categorical data, probability and simulation, binomial distributions, confidence intervals, and more."

Contents: Part 1, Exploring Data: Graphical Displays of Univariate Data. Summarizing Distributions of Univariate Data. Comparing Distributions of Univariate Data. Exploring Bivariate Data. Describing Categorical Data. Part 2, Planning a Study: Randomization in Sampling and Experiments. Part 3, Probability with Simulations: Probability as Relative Frequency, The Normal Distribution, Sampling Distributions, Sampling Distribution of Differences. Part 4, Statistical Interface: Confidence Intervals. Tests of Significance. Special Cases of Normally Distributed Data. Appendices: Installing the Statistics with List Editor Application. Quick Reference for the Statistics with List Editor Application. Index.

(*Extensions* is available in electric form only at http://epsstore.ti.com.)

"This book gives additional topics that could be used in a first or second course in statistics, including Analysis of Variance, Multiple Regression, Forecasting, and Nonparametric methods. "

Part 5: Other Probability Distributions. Inference for the Standard Deviation and Variance of Normal Populations for One and Two Samples (The F Distribution). Analysis of Variance (ANOVA), One- and Two-Way. Multiple Linear Regression. Forecasting. Some Non-parametric Procedures. More Fits to Bivariate Data. Appendices: Installing the Statistics with List Editor Application. Quick Reference for the Statistics with List Editor Application. Program Listings for exsmooth and forecast. Index.

Investigating Statistics with the TI-92
Brendan Kelly, Brendan Kelly Publishing, ISBN 1-895997-06-2

RS-92 Resampling Stats for the TI-92
Bill Quails, Resampling Stats Inc., 1997.

Statistics and Probability with the TI-89
Brendan Kelly, Brendan Kelly Publishing, ISBN 1-895997-14-3

The Practice of Statistics: Ti-83/89 Graphing Calculator Enhanced
Daniel S. Yates et al, Publishes June 2002

Geometry

92 Geometric Explorations on the TI-92
Michael Keyton, Texas Instruments, 1996, ISBN 1-886309-06-X
(TI Explorations series, high school geometry, $22.50)

"This book provides a variety of student activities using Geometry on the TI-92. Activities ranging from preliminary discovery of basic theorems typically seen in a high school course to advanced explorations show students exciting geometric results.

"The activities are arranged in a logical sequence for a high school syllabus, but are not in the order of any specific textbook. They have been designed as independent of each other as possible. Thus, you can reorder them to fit any sequence."

Contents: Segment Partition (Between) and Midpoint. Distance from a Point to a Line (Circle). Angle Partition (Addition) and Angle Bisector. Vertical Angles. Perpendicular Bisector. Perpendiculars and Parallels. Linear Pair and Perpendicular Pair. Bisectors of Two Angles That Form a Linear Pair. Angle Bisector (Characterization). Circle (Radius, Diameter, Chord). Triangle: Medians and the Centroid. Isosceles Triangle. More About the Isosceles Triangle. Angle Inscribed in a Semicircle. Altitude, Median, and Angle Bisector of a Triangle. Parallel Lines and Angles. Triangle Sum. Equilateral Triangle and a Curiosity. Perpendicular Bisectors: Circumcenter and Circumcircle. Three Points Determine a Circle (sometimes). Triangle: Altitudes and the Orthocenter. Pedal Triangle of a Point and a Triangle. Angle Bisectors: Incenter and Incircle. Midsegments and the Medial Triangle. Tangents to a Circle. Trisecting a Segment. Hinges. Geometric Mean. Animation and Locus. Right Triangle; Making a Table. Using a Table to Make Conjectures. Arc Measure Macro. Inscribed Angle and Angle Formed by Two Chords. Angle Formed by Two Secants or a Secant and a Tangent. Angle Formed by a Tangent and a Chord or by Two Tangents. Steiner's Power of a Point / Chord-Chord. Steiner's Power of a Point / Secant-Secant / Secant-Tangent. Equilateral Triangle and Square. Parallelogram. Isosceles Trapezoid. Rectangle. Rhombus. Kite. Cyclic Quadrilateral. Varignon Quadrilateral. Curiosity of an Isosceles Triangle, Rectangle, Isosceles Trapezoid. Pythagorean Theorem. Midvexes of a Parallelogram. Perpendicular and Parallel Angles. Intersecting Circles. Parallel Lines and Proportions. Parallel Through a Side of a Triangle or Through a Circle. Angle Bisector of a Triangle. The Nine-Point Circle. Trisection Polygons. A Maximum and a Minimum in One Problem. Midvex of a Parallelogram and Isosceles Triangle. Tangents to Two Circles. Angle Bisector Revisited. Triangles with Parallel Sides (Homothecy). Distance From a Point to a Line (Circle Triangle) to a Point. Dilations (Homothecy Revisited). Similar Triangles Are Everywhere. Trigonometric Tables. The Medial Triangle Revisited (Homothecy). The Euler Line. Circumcircles, Reflections, and (...). Antipedal Point and Triangle. Harmonic Conjugates. Menelaus. Ceva. Menelaus, Ceva, and Harmonic Conjugates. Quadrilateral and Harmonic Conjugates. Pappus. Desargues. Pascal's Mystic Hexagram. Miquel. Carnot. Centroids Galore and What Point Is It Anyway? Wallace Line. Tritangent Circles. Gergonne. Nagel. Feuerbach: The Tritangent Circles and the Nine-Point Circle. Isotomic and Isogonal Conjugates. Bisectors of Interior and Exterior Angles of a Triangle. Maltitudes, Diacenter, and Medcenter. Cyclic Quadrilateral Curiosities. Butterfly. Brocard Points. Orthocenter and Circumcenter. Orthocenter Revisited. Teacher Information. References.

Geometrical Investigations for the Classroom on the TI-92
Charles Vonder Embse, Arne Engebretsen, Texas Instruments, 1996, ISBN 1-886309-04-3
(TI Explorations series, high school geometry, $16.00)

"The explorations in this book are intended to promote an environment of inquiry through thought provoking, open-ended problems. There is no intended order of topics. Any exploration can be used where it fits into your program. There is no suggested time for an exploration. Some students may think about a given problem for weeks or months, coming up with new insights and interconnections as they consider other problems. It may be appropriate to present one exploration, or part of one, each grading period as a group or individual project.

"No matter how you use these activities, the emphasis should be on exploration - trying anything and everything that comes to mind. Once the discoveries are made, ask students to explain why they are true. Depending on the level of the students, these explanations could be anything from statements of the findings to detailed proofs. But remember, like real mathematics in the making, proof should be the final step in the discovery process, not the first."

Contents: Investigating Properties of Kites. Investigating Properties of Trapezoids. Investigating Properties of the Diagonals of Quadrilaterals. The Orthocenter of a Triangle. Cyclic Quadrilaterals. Tessellations and Tile Patterns. Polygons and Vectors. The Simson Line. Investigating Properties of Lines in the Plane. Construction Tools: Interactive Function Graphs.

Geometry Explorations and Applications, Activities for the TI-81, TI-82 and TI-92 Calculators
McDougal Littel Publishing

Skill and Practice Masters in Geometry Using the TI-92
David P. Lawrence, Pencil Point Press, Inc., ISBN 1-58108-020-4

Engineering

Electrical Engineering Applications with the TI-89
David R. Voltmer, Mark. A. Yoder, Texas Instruments, 1999, ISBN 1-886309-25-6
(TI Explorations series, university electrical engineering, $22.50)

"To Students:

"This book is written for electrical engineering students. It is a collection of examples that show how to solve many common electrical engineering problems using the TI-89. It is not a textbook; if you do not know how to solve the problem, look it up in your textbook first. If you do know how to solve the problem, this book will show you how to use the TI-89 to get the answer with more insight and less tedium. We show you how to use the TI-89 in class, in lab, on homework, and so forth.

"To Instructors:

"When writing this book, we resisted the temptation to show how the TI-89 can be used to solve problems in ways that differ from standard electrical engineering texts. Although it has the power and ability to approach many problems in new ways, that was not our focus. Our focus is to help students learn the basic material better by showing them how to use the TI-89 to do the tedious things so they don't get lost in the details. Our approach was best summed up by Gottfried Wilhelm Leibniz when, in the 17th century, he said, "It is unworthy of excellent men to lose hours like slaves in the labor of calculation." "

Contents: DC Circuit Analysis. Transient Circuit Analysis: Symbolic. Transient Circuit Analysis: Numeric. Steady-State Circuit Analysis and Filter Design. Power Engineering. Laplace Analysis: The s-domain. The Convolution. Fourier Series. Vectors. Vector Calculus. Electromagnetics. Transmission Lines. Antennas. Manipulating Lab Data: The Diode. Financial Calculations. Index.

Engineering and Technical Math on the TI-92: Electronic and Electrical Applications
Charles R. Adams, David Hergert, Texas Instruments, 1997, ISBN 1-886309-10-8
(TI Explorations series, High school and university electrical engineering, $22.50)

"This book was written to show the power of the TI-92 for electrical and mechanical students at the vocational and two year technical level. Also included in the text are highlighted sections appropriate for engineering students.

"The goal of the authors is to help students customize the TI-92 for electrical applications. The TI-92's rich set of mathematical and engineering features make it far superior to any other calculator of its kind. The instructions in this book on formula entry, graphing, data collection and display, the CBL utility and report writing will help students and technicians fully utilize the TI-92's capabilities.

"This electrical volume shows the most commonly used formulas for electrical technicians and engineers. It works as a great supplement to textbooks on circuit analysis and electronics.
Some of the features of the TI-92 are highlighted through examples, including:

- Introduction of vectors and phasors using-the powerful Vector tool from the Geometry menu.
- Use of PopUp list boxes which allow students to select colors for the resistor color code, and material selection for resistivity.
- Use of the powerful solve utility to rearrange Ohms Law and the Power formula. This should be of great use to high school students not yet adept at algebra.

- Use of a function that parallels resistors. This function allows students to enter complex series-parallel circuits in a simple format.
- A complete set of base conversions (including fractional) for digital electronics.
- Graphical display of a charging capacitor.
- Display and analysis of two and three phase waveforms, similar to the method used to calculate phase shift on an oscilloscope.
- Use of functions to calculate the impedance of capacitors and inductors. These functions allow students to enter complex AC impedance in a simple one-line format.
- A description of how readings can be directly entered into the calculator while an experiment is being performed. A DC motor is used as an example.

"All of the examples are geared toward helping students understand the power and convenience of the TI-92. Many of the examples would be more difficult or impossible if attempted on another calculator.

Contents: Chapter 1, Basic Use of the TI-92: Solving Equations. Entering Numbers. Display Digits Mode. Inserting and Over-Typing. Storing and Recalling Variable Values. Keyboard Shortcuts. Pretty Print Mode. Displaying the Home Screen. Graphing a Function. Exponents and Powers of Ten. Coordinate Conversions. Chapter 2, DC Circuit Analysis: Ohm's Law. The Power Formula. Current and Charge. The Resistivity Equation. The Resistor Color Code. Capacitor Charging. Parallel Resistance. Collecting and Displaying Motor Data. Chapter 3, AC Circuit Analysis: The Sine Wave. Capacitive and Inductive Reactance. Solving Series AC Circuits. Solving Parallel AC Circuits. Average Value. Average Value (Sine Wave). RMS Calculations. Chapter 4, Digital Electronics: Base Conversions. Converting from Binary to Decimal. Converting From Decimal to Binary. Converting Binary to Hex. Converting Hex to Binary. Converting from Hex to Decimal. Converting Decimal to Hex. Binary Addition. Binary Subtraction. Boolean Operations. Chapter 5, Analog Electronics: Diode Circuit Operating Point. Common Emitter Amplifier. Chapter 6, Power Distribution: Y to Delta and Delta to Y Resistance Conversions. Three-Phase Circuits. Three-Phase Power. Chapter 7, Magnetism and Electromagnetic Fields: Magnetic Flux. Induced Voltage in a Magnetic Field. Force Generated in a Magnetic Field.

CBL, CBR

TI-92 and CBL Lab Manual: Precalculus Applications
Glencoe Publishing, 1996, ISBN 0-02-824316-1

Microchemistry for the TI-92/CBL
Tom Russo, Theta Technologies, ISBN 1-888167-05-X

Other calculator books

Handbook of Electronic Design and Analysis Procedures using Programmable Calculators.
Bruce K. Murdock, Van Nostrand, 1979, 525pp.

TI-59 and HP-41CV Instrument Engineering Programs
Stanley W. Thrift, Gulf Publishing Co., 1983, 366pp.

Scientific Analysis on the Pocket Calculator
Jon M. Smith, John Wiley & Sons, 1977 (2nd ed), 446pp, ISBN 0-471-03071-6
Contents: Introduction to pocket calculator analysis. Numerical evaluations of functions on the pocket calculator. Advanced analysis on the pocket calculator. The programmable pocket calculator. Financial analysis for engineers and scientists. Appendices: Some tricks of the pocket calculator trade, Matrix analysis on the pocket calculator, Complex numbers and functions, Formulas for commonly encountered calculations.
(Highly recommended by DAB)

Advanced Applications for Pocket Calculators
Jack Gilbert, Tab Books, 1976, 304 pp. ISBN 0830658246

Calculator Programs for Chemical Engineers
Vincent Cavaseno, ed, 1982.

Microwave Circuit Design Using Programmable Calculators
J.W. Allen, M.W. Medley, Artech House, 1980, ISBN 0-89006-089-4
Procedures for performing S-Parameter calculations with HP and TI programmable calculators.

Statistics By Calculator: Solving Statistics Problems With The Programmable Calculator
Peter W. Zehna, Prentice-Hall, 1982, 308 pp, ISBN 0138448116

Engineering Statistics with a Programmable Calculator
William Volk, McGraw-Hill, 1982, 362pp, ISBN 0-07-067552-X
Contents: Introduction. Statistical parameters. Probability distributions. The t test. Chi square test. Variance and the analysis of variance. Regression. Appendices: Hewlett Packard calculator programs, Texas Instruments Calculator programs. Programs for HP-97 and TI-59.

Mathematical Astronomy With A Pocket Calculator
Aubrey Jones, Wiley, 1978, 254pp, ISBN 0-470-26552-3
Contents: Time. Precessional constants for selected epochs. Reduction for precession. Reduction from mean to apparent place. Proper motion. Sun, moon and planets. Visual binary star orbits. Ephemerides of comets. Approximations. Appendices: Visual binary star orbits. Programs for calculators using RPN logic. Index.

Practical Astronomy with your Calculator
Peter J. Duffet-Smith, Cambridge University Press, 1989, 200pp.

Illustrated Pocket Programmable Calculators In Biochemistry
John E. Barnes, Alan J. Wring, John Wiley & Sons, Inc., 1980, 363 pp.
For use with Hewlett-Packard HP-67/97 and Texas Instruments TI-58/59.
Contents: Aqueous solutions of Small Molecules. Macromolecules In Solution. Sedimentation. Ligand Binding and Kinetics. Thermodynamics In biochemistry. Spectroscopy. Isotopes In Biochemistry. Appendices. Index.

Phaselock Loops for DC Motor Speed Control
Dana Geiger, Wiley, 1981, 206pp, ISBN 0471085480
Uses TI-59 programs

Reservoir Engineering Manual.
Reuven Holo, Haresh Fifadaro, Penn Well Books, 1980.
27 reservoir engineering programs. Uses TI-59 programs.

Drilling Engineering Manual
Martin E. Chenevert, Reuven Hollo, Penn Well Books.
A manual, based on use of the TI-59 programmable calculator or similar ones for petroleum engineers covering nearly all phases of drilling.

Synthetic-Hydrograp Computations on Small Programmable Calculators
Thomas Croley, Iowa Institute of Hydrologic Research, 1980, ISBN 0874140153.

Astro-Navigation Calculator: A Handbook for Yachtsmen
Henry Lesion, David & Charles, 1984, 112pp.

"Written especially for yachtsmen, this book shows how the traditional methods of obtaining an astro-navigational fix can be superseded by using a scientific pocket calculator and a new book of calculator tables."

Calculator Navigation
Mortimer Rogoff, Norton, 1979, 418pp, ISBN 0-393-03192-6
Contents: Calculators and navigation. Coastwise navigation. Sailing. Celestial navigation. Loran. Appendices: Recording procedures, Customized programs, Setting decimal and trigonometric mode on the HP-67 / HP-97, Non-print operation of the HP-97, Interrupting the display interval on the HP-67, Using the HP-41C, Program listings. Index.

Radar Calculations Using the TI-59 Programmable Calculator
William A. Skillman, Artech House, Inc. 1983, 405pp, ISBN 0-89006-112-2.
Contents: Preface, Antennas, Propagation, Detection Probability, Signal-To-Noise Calculations, Filters and Filtering, Receivers and Processing, Appendices:. Basic Operations, Extended Operations, Calculator Clubs and Books, Master Library Subroutines, Translation from TI-59 to Basic, List of Acronyms and Abbreviations, List of Symbols, Index.