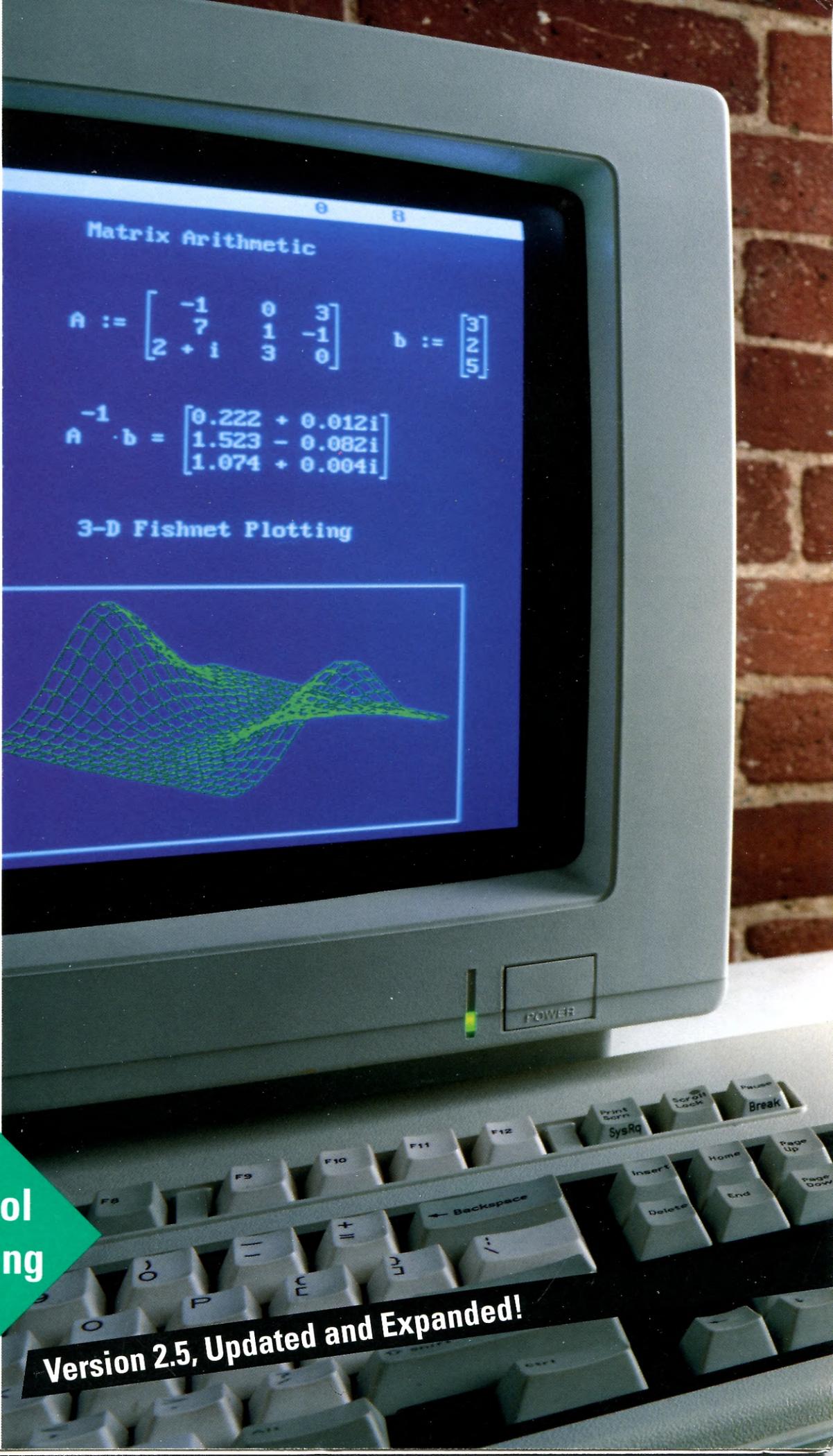


# MathCAD

2.5

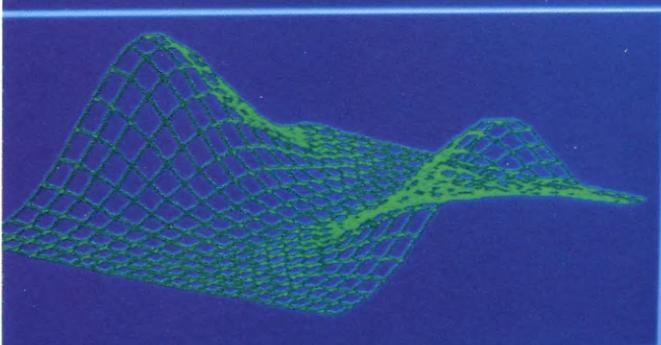


Matrix Arithmetic

$$A := \begin{bmatrix} -1 & 0 & 3 \\ 7 & 1 & -1 \\ 2 + i & 3 & 0 \end{bmatrix} \quad b := \begin{bmatrix} 3 \\ 2 \\ 5 \end{bmatrix}$$

$$A^{-1} \cdot b = \begin{bmatrix} 0.222 + 0.012i \\ 1.523 - 0.082i \\ 1.074 + 0.004i \end{bmatrix}$$

3-D Fishnet Plotting



The  
Software Tool  
for Calculating  
Minds

Version 2.5, Updated and Expanded!

## A Product with a Track Record

MathCAD has an installed base of over 55,000 users and was recently introduced on the Macintosh. Recent additions to the product include 3-D plotting, HPGL sketch import and multiple block cut and paste. MathCAD also has enhanced numerical accuracy, as well as PostScript-compatible printer support.

## A Scratchpad for Forming Your Ideas

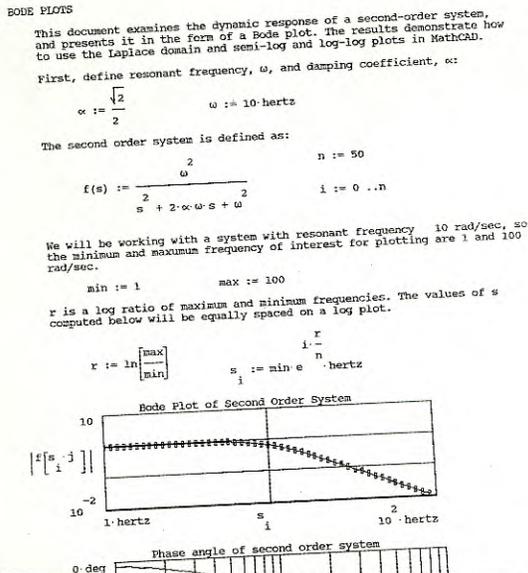
First, define your variables using familiar mathematical symbols. Place definitions wherever you want them on the screen, just as you'd do on paper. Next, set up your functions and plots. You can scale the plot yourself, or let MathCAD do it for you.

MathCAD generates each plot as soon as you specify the variables. If something looks wrong, just change a variable or the value of a constant, and see the effect on your plot immediately. Asking "What if?" was never so easy.

Remember that the variables, functions, and plots on the screen are not isolated - they're all part of a unified whole. The variables defined at the beginning are valid throughout your document and can specify the range of the plot at the end.

Of course, the last thing you need when you are trying to sort out a problem is a hassle with unit conversions. MathCAD takes care of unit conversions for you and gives you the answer in whatever units you require.

MathCAD prints documents with equations, graphics and text.



## Reviewers say this:

*Headed straight for the best-seller list... Rather than force users to translate equation-writing into unfamiliar 1-2-3 or FORTRAN language, MathCAD's developers have taken the extra trouble to create a program that's almost intuitively obvious to use.*

- Soft-Letter

*It's hard to do justice to this software in any review. You feel like you've just discovered the power of a computer for the first time (something like the first users of spreadsheets must have felt)... What's really nice when I'm done is to print the results and show my colleagues how easily I generated them.*

- IEEE Software

## A What-If Tool for Refining Your Ideas

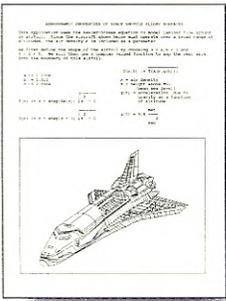
You've evaluated your first set of assumptions. The equations look right, but the results are way off base. Now what? With MathCAD, the next step is easy: Make an educated guess about the source of the problem and change the appropriate relationship, constant, or range. MathCAD will recalculate all your functions and plots. You can see the results instantly. And if you decide that you're closing in on the solution, you can try another, slightly more educated guess.

Or maybe the results are right on target, but you'd like to try it with different input. This is easy, too. Save the current results in a file, change the necessary variables, and MathCAD will immediately recalculate everything for you. Print both versions and you have some instant results to analyze.

## A Report Generator for Presenting Your Ideas

You've got the results you want. Now to present them to the world! MathCAD makes it easy to convert your scratchpad notes to a finished memo or report you can present without apologies. Add some space between the formulas, insert some explanatory text, and you have a thorough exposition, complete with formulas, tables, plots and commentary. Add a header and make it a memo, or add an introduction and make it a full report.

And if you decide you want to change something after creating the report, MathCAD is still there to help. Your MathCAD report is a live document that maintains all the mathematical relationships you created in your scratchpad. Just make the necessary changes; MathCAD will calculate new results, and you're ready to print the revised report.



MathCAD documents can include HPGL sketch imports from most popular CAD programs.

...MathCAD by a mile. It has the widest array of functions and an interface that is closest to a pencil and paper. MathCAD [offers] everything you have dreamed of in a mathematical toolbox.

- PC Magazine, Best of '88  
Best of '87

Clearly, MathCAD represents the state of the art in equation solvers. ...You can explore MathCAD for days and keep finding new goodies. If you're a scientist or engineer, run out and get MathCAD right away. You won't regret it!

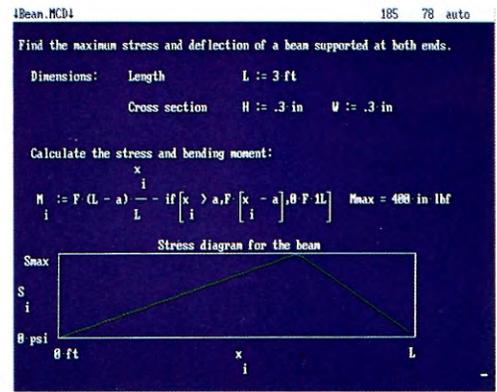
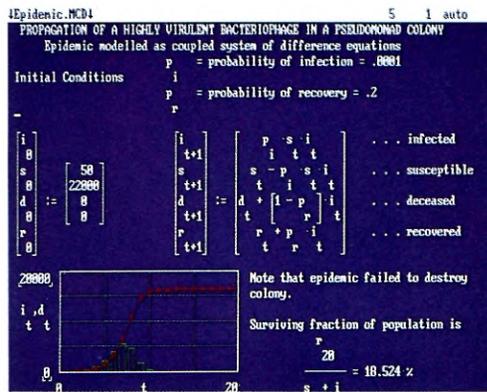
- Science Software

### Users say this:

MathCAD does for scientific computations what a PC does for personal computing. MathCAD provides excellent numerical accuracy and integrity of units in a format that is easy for other people to understand. ...What results is like having a page of your math text book come alive into living mathematics.

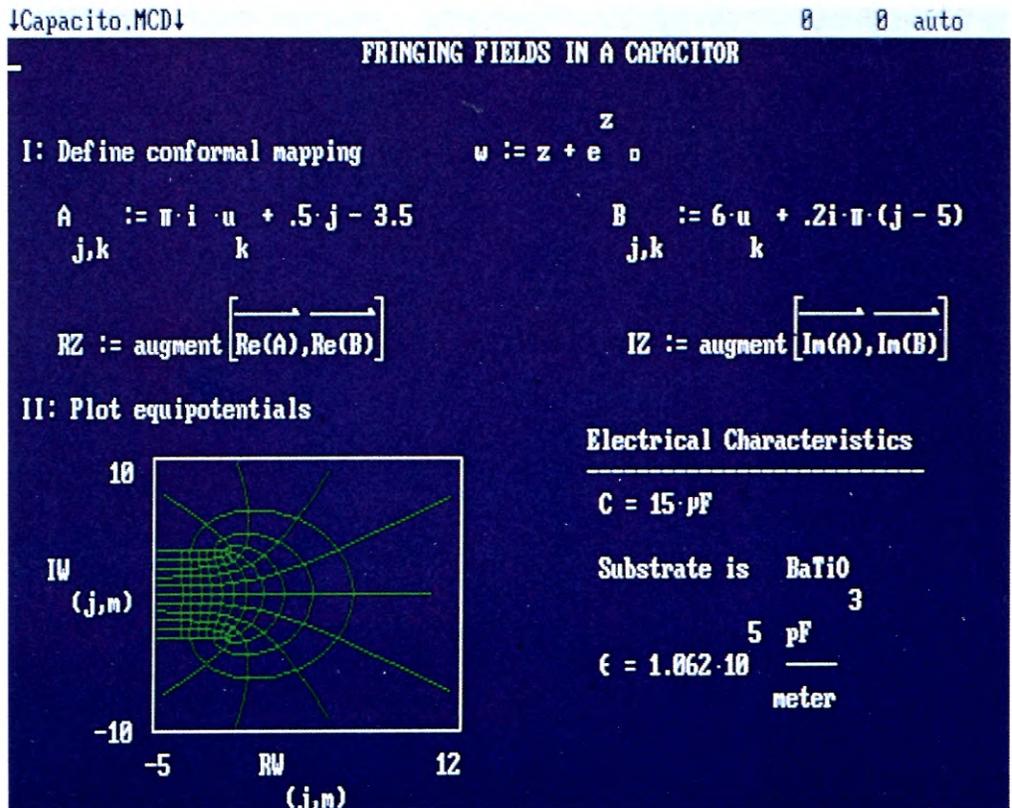
- Lance Simpson  
Design Engineer  
Dow Chemical Company

## You Do the Thinking, MathCAD Does the Math



Whether you are building bridges or using fractals, MathCAD can do the math while you do the thinking.

- 1 Statistical modelling.
- 2 Beam analysis.
- 3 Sonar array analysis.
- 4 Electronic component design.
- 5 Population distribution.



I really enjoy MathCAD's easy-to-use interface and highly interactive nature. The physical units feature and the built-in error checking are very good, and keep me from making mistakes. I have used MathCAD for everything from engineering design to small scale theoretical calculations, and I think that it's a first-rate product.

- Richard Peutter  
Associate Research Physicist  
University of California, San Diego

You've done something very good for the engineering profession by producing MathCAD. It is by far the best mathematical manipulation program available. It's just superb.

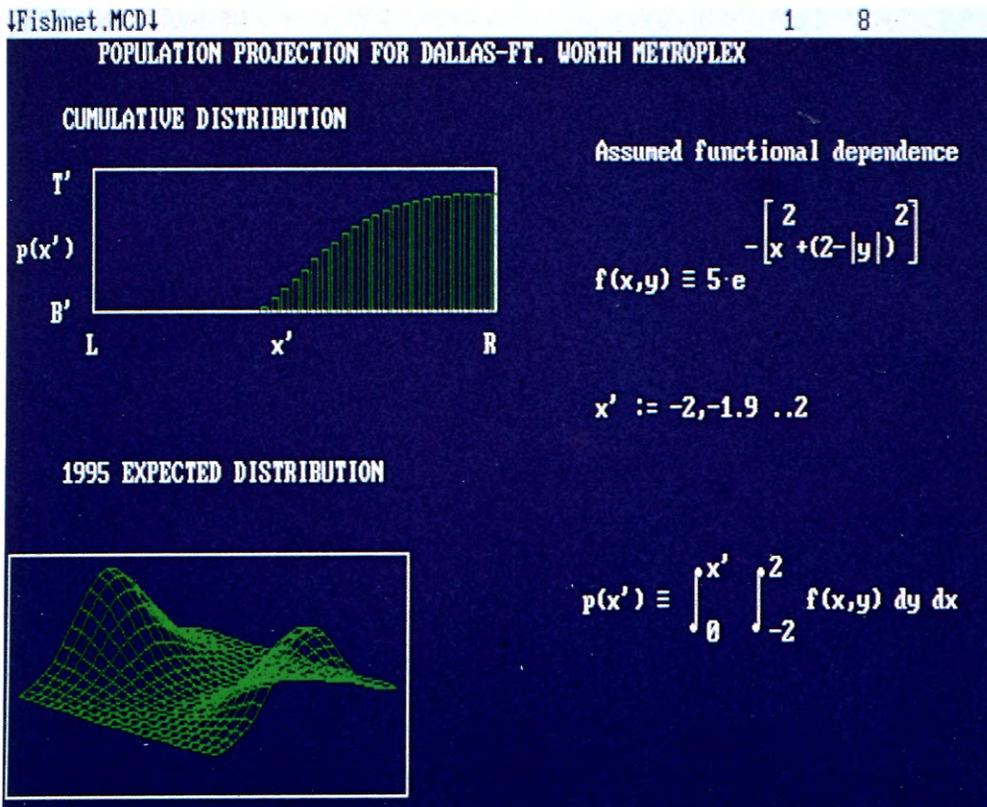
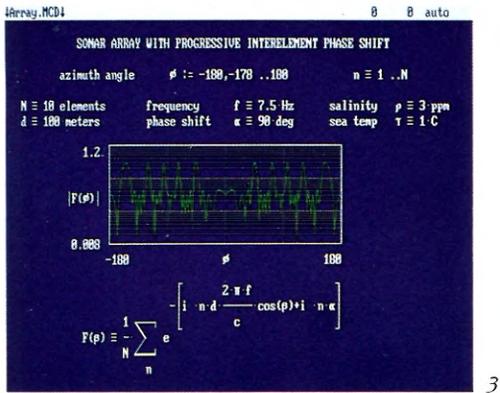
- J.O. W. Halina  
JOW Halina & Co.  
Hull, Quebec

In my work with signal processing, analysis that is too intensive to do by hand and isn't worth the time to code in FORTRAN is now done quickly with MathCAD. I think MathCAD is terrific!

- Richard A. Bachmann  
Senior Engineer  
Westinghouse Electric Corporation

...I have used MathCAD as a 'required' text in my undergraduate course and have had good success with it. Students are turning in better exercises and the comprehension level is up. However, it is no less work for the students because I have expanded the exercises to broaden their experience.

- Lee C. Wensel  
Professor of Forest Biometry  
University of California, Berkeley



$$9.42 \frac{\text{lb}}{\text{in}} + 171 \frac{\text{cm}}{\text{cm}} = 122.98 \frac{\text{kg}}{\text{m}}$$

$$b = \begin{pmatrix} 3.65 \\ 10^{-4} \\ 2 \end{pmatrix}$$

$$= 6.878 \frac{\text{lb}}{\text{in}}$$

$$x = A^{-1} \cdot b$$

$$x = \begin{pmatrix} -0.074 \\ 0.333 \\ 1.266 \end{pmatrix}$$

## The Software Tool for Calculating Minds

If you do numerical calculations, you use a pad and pencil. Sure, a calculator can help with the numbers. FORTRAN or C can do the job if you're willing to program every time you need an answer. And spreadsheets work until you need to see the underlying equations and document them. Even with advances in desktop computing, you haven't had real choices - you start and end on paper.

Until now. Until MathCAD. Just as the spreadsheet became invaluable to financial analysts because it functioned like and looked like the familiar paper ledgers - so MathCAD has become the tool of choice for technical professionals. Because it looks and works the way engineers and scientists work and think.

### MathCAD:

- ◆ uses familiar mathematical notation;
- ◆ virtually eliminates the learning curve;
- ◆ uses defined, readily available, functions of all types;
- ◆ calculates results as you enter equations;
- ◆ produces presentation-quality reports.

If spreadsheets don't have the math-power you need, if dimensional inconsistencies frequently add to your headaches, and if you find yourself writing the equations into your reports by hand, then you need MathCAD.

MathCAD operates in the familiar notation of traditional mathematics. Forget SQRT, ABS, @SUM, and the other "computer math" you put up with in programming languages and spreadsheets.

### Serious Math

MathCAD does the serious work - math that would stump the spreadsheets and even be a hassle to program in FORTRAN or C. You name it: complex arithmetic, Fast Fourier Transforms, integrals, derivatives, Bessel functions, matrices, simultaneous linear and nonlinear equation-solving, statistics, and lots more.

### Special Applications

And if your needs extend beyond MathCAD's complement of functions and operators, application packs are available from MathSoft to add even more to MathCAD's capabilities. Each application pack contains all the relationships normally used in the area of specialization. These packs can be loaded into MathCAD and used just as you use the built-in formulas or your own live documents.



# MathCAD 2.5 Specifications

## Data Files

Read or write ASCII data files (data separated by commas or spaces).  
Read or write a vector or matrix.  
Read column data (Lotus PRN file).  
File format compatible with Macintosh MathCAD.

## Text Capabilities

Automatic word wrap.  
User-settable text widths and margins.  
Unlimited size, shape and number of text regions.  
Multiple block cut and paste.

## Plotting and Sketch Import

Graph size: up to 127 lines by 127 columns.  
Plot any number of expressions.  
Linear, semi-log or log-log scaling.  
Optional grid lines.  
13 line and symbol types.  
Automatic or manual scaling.  
Three-dimensional surface plots.  
Imports HPGL files from AutoCAD and other drawing programs.

## Built-In Functions and Variables

### Trigonometric

sin  
cos  
tan  
asin  
acos  
atan  
angle  
*angle to point (x,y)*

### Hyperbolic

sinh  
cosh  
tanh  
asinh  
acosh  
atanh

### Other math

exp  
log  
ln

### Complex

arg  
Re  
Im

### Bessel

Y0  
Y1  
Yn  
J0  
J1  
Jn

### Truncation

floor  
ceil

### File access

READ  
WRITE  
APPEND  
READPRN  
WRITEPRN  
APPENDPRN

### Array

last  
length  
max  
min

### Matrix

rows  
cols  
identity *identity matrix*  
 $\delta$  *Kronecker delta*  
 $\epsilon$  *antisymmetric tensor*  
augment *combine matrices*  
tr *trace*

### Statistical

mean  
var  
stdev  
corr  
slope  
intercept  
 $\Gamma$  *Euler's gamma*  
erf *error function*  
cnorm *cumulative normal*  
hist *histogram*

### Cubic spline

lspline  
pspline  
cspline  
interp

### Fourier transform

fft *fft*  
ifft *inverse fft*  
cfft *complex fft*  
icfft *inverse cfft*

### Special

if *conditional*  
linterp *linear interpolation*  
rnd *random number*  
 $\Phi$  *Heaviside step*  
until *stop on condition*  
mod *remainder*  
root *solve expression*

### Predefined variables

$\pi$   
e  
 $\infty$   
%  
TOL *tolerance*  
ORIGIN *array origin*  
PRNPRECISION  
PRNCOLWIDTH

## Numbers and Units

15 digits of precision.  
Complex numbers in any calculation.  
Automatically computes and displays dimensions.  
Checks equations for dimensional consistency.  
Includes MKS, cgs, and US Customary unit definitions and conversions.

## Arrays and Matrices

Single or double subscripts.  
Scalar, vector, or matrix variables.  
Size: up to 8000 array elements.  
Arrays can be defined iteratively.  
Matrices can be entered or viewed in standard two-dimensional notation.  
Tables for viewing results.  
Matrix addition, multiplication, inverse, transpose, determinant.  
Scalar multiplication, dot product.  
User-definable vector and matrix valued functions.

## Solving

Up to 50 simultaneous linear and nonlinear equations and inequalities.  
Up to 50 unknowns.  
Complex variables and roots.

## Operators

(x)	Parentheses
$\vec{x}$	Vectorize
$x^{<i>$	Superscript
-x	Negation
x+y	Addition
x-y	Subtraction
x·y	Multiplication, dot product, matrix product
x×y	Cross product
$\frac{x}{y}$	Division
$x^y$	Power, matrix power, matrix inverse
$\sqrt{x}$	Square root
$x^t$	Transpose
x!	Factorial
x	Absolute value, determinant, norm
x,	Subscript
$x_1..$	Addition with line break
+y	
x>y	Greater than
x≥y	Greater than or equal to
x<y	Less than
x≤y	Less than or equal to
x≈y	Equal to
x≠y	Not equal to
$\bar{x}$	Complex conjugate
$\sum x$	Sum of vector
$\sum_i x_i$	Summation
$\prod_i x_i$	Product
$\int_a^b f(x) dx$	Integral
$\frac{d}{dx} f(x)$	Derivative

### Equation Types

10 + 2<sup>5</sup> = 42 Calculate result  
x := a + b Define variable  
x ≡ 3.5 Define variable globally  
f(x,y) := x<sup>2</sup>-y<sup>2</sup> Define function  
i := -5, -4 ..5 Define range var.  
x<sub>i</sub> := sin(i) Define subscripted var.  
e<sup>x</sup>≈x<sup>2</sup> Define constraint equation for solving

## Printing

Create page breaks anywhere in document.  
Print all or part of document.  
Print to disk file or printer.  
Prints document as you see it on the screen, but with higher resolution.

## General Capabilities

Unlimited document length and width.  
Cut, paste, and copy multiple regions of equations, plots, and text.  
DOS commands accessible from MathCAD.  
Supports all cursor-movement keys.  
Pull-down command menus.  
Optional second window.  
Line insert and delete.  
Search and replace in plots, equations, and text.  
Automatic or manual calculation mode.  
Individual equations can be enabled or disabled.  
Wildcard menus for file loading and saving.  
Editable configuration file specifies system defaults.

## Devices Supported

### Graphics Cards

IBM Color Graphics Adapter or compatible.  
IBM VGA or compatible (PS/2 displays).  
IBM Enhanced Graphics Adapter or compatible.  
Hercules Monochrome Graphics Card.  
AT&T 6300.  
Toshiba T3100, T5100.

### Plotters

Hewlett-Packard plotters.

### Printers

Apple LaserWriter or other PostScript-compatibles.  
Epson graphics printers.  
Hewlett-Packard ThinkJet, QuietJet, LaserJet, LaserJet Plus, and LaserJet Series II.  
IBM Graphics Printer, Proprinter, or compatible.  
Also printers from Okidata, Toshiba, C. Itoh, Diconix, Texas Instruments, JDL, and NEC.

### Memory

DOS memory up to 640K.  
Expanded memory: Lotus/Intel/Microsoft specification.  
Includes Intel AboveBoard, AST Rampage!

### System Requirements

IBM PC, XT, AT, PS/2 or compatible.  
DOS 2.0 or later.  
512K RAM minimum.  
Math co-processor recommended.

# Math Soft

$\Sigma + \sqrt{-} = \times \int \div \delta$

### MathSoft, Inc.

One Kendall Square

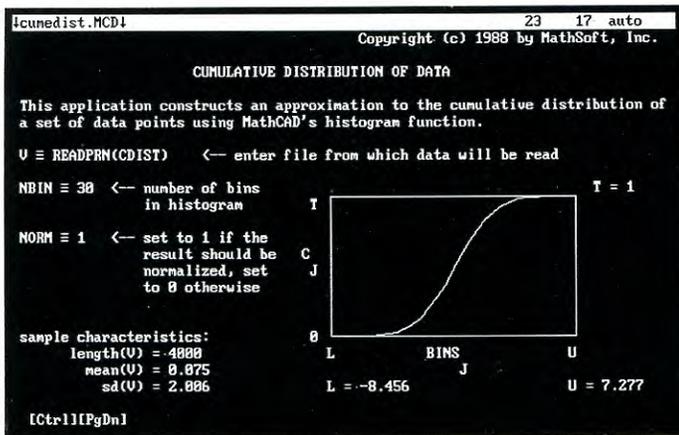
Cambridge

Massachusetts

02139

Telephone 1-800-MathCAD

or 617-577-1017



# Statistics Applications Packs

MathCAD® from MathSoft is the leading PC-based software for calculating, solving, and documenting technical problems. It provides a broad range of mathematical features that give the technical professional a dynamic environment in which to work. High-level computational power using the real language of mathematics, as well as on-screen equation and text editing features, permit great flexibility for technical problem solving.

Two statistics applications packs make MathCAD's computational and plotting capabilities even more versatile. They include a variety of tests and techniques that allow MathCAD users to perform standard test procedures, create their own test procedures, simulate experiments, and model data from within their MathCAD document.

Unlike dedicated statistical software packages, these applications packs have been designed for technical professionals who occasionally require statistical analysis. Statistics I: Tests and Estimation and Statistics II: Modeling and Simulation each contain sixteen fully documented routines. When loaded into a MathCAD document, each routine can be used immediately to perform test procedures or can be easily customized to meet specific requirements.

## Statistics I: Tests and Estimation

This applications pack contains a set of standard tests including parametric and nonparametric techniques from which you can create your own test procedures. It includes:

### *Chi-square Test for Goodness of Fit*

This application carries out a chi-square test for goodness of fit between observed results and frequencies predicted by a model.

### *A Two-way Contingency Table*

This model sets up a two-way contingency table and calculates the chi-square statistic to test for independence of row and column classifications.

### *One-way Analysis of Variance*

This statistical model calculates within-group and among-group variances and finds the critical F value to test equality of group means.

### *Choosing the Sample Size for a t Test on Means*

This application calculates the sample size required to set up a t test for equality of means, for a given power and significance level.

### *A t Test on Means*

This application tests for equality of means using samples from two populations with a common variance.

### *The Wilcoxon Test*

This application calculates the Wilcoxon statistic for a sample and sets up the Wilcoxon test for equality of medians of two populations.

### *The Rank Sum Test*

This model computes the rank sum statistic for a pair of samples to test for equality of underlying distributions.

### *Kendall's Tau*

The Kendall's rank correlation coefficient tau is found for two sets of paired data to test for a correlation between the rankings.

### *Spearman's Rank Correlation Coefficient*

This model calculates Spearman's rank correlation coefficient and sets up a t test for the significance of the correlation.

### *The Kolmogorov-Smirnov Test*

This model measures the difference between an empirical distribution and a given continuous distribution by calculating the Kolmogorov-Smirnov statistic and finding its significance.

### *Counting Runs*

This application illustrates the use of run counting to measure independence of successive trials in a sequence to test whether two samples are drawn from the same distribution.

### *Estimating the Mean of a Normal Population*

Confidence limits are calculated for an estimate of the mean of a normal population.

### *Jackknife Estimates*

This model shows how to carry out the jackknife process for estimating a population parameter and assigning a standard error to the estimate.

### *Bootstrap Estimates for Standard Error*

A set of bootstrap samples are drawn from a given sample and are used to estimate the standard error for an estimate of a population parameter.

### *Sorting and Finding the Median of an Array*

This application sorts a vector of data into ascending or descending order and finds the median.

### *Estimating the Median*

Using MathCAD's histogram function, this application estimates the median of a large set of data.

### *Probability Distributions*

This model calculates the values of the cumulative normal, chi-square, student's t, F, and beta distributions and illustrates the use of MathCAD's root function to find percentage points.

## **Statistics II: Modeling and Simulation**

This applications pack contains techniques for modeling data and carrying out simple Monte Carlo simulations. The applications include:

### *Frequency Distribution of Data*

This model plots a frequency distribution histogram for a set of data and calculates the mean, standard deviation, skewness, and kurtosis.

### *Cumulative Distribution of Data*

An approximate cumulative distribution function is found and plotted for a set of data.

### *Smoothing With Running Medians*

This application smooths a data sequence by computing successive running medians of three and plots the result.

### *Multiple Regression*

This model finds regression coefficients for the linear best fit to a set of n-tuples and calculates residuals.

### *Forecasting by Exponential Smoothing*

Using double exponential smoothing, this model makes one-period-ahead forecasts from a data sequence and plots the data, the smoothed sequence, and the forecast errors.

### *Simulating a Multinomial Experiment*

A random sample is drawn from a multinomial distribution with given event probabilities.

### *Operating Characteristic Curves*

This application plots the lot acceptance probability, average outgoing quality, and average total inspection for a single sampling plan.

### *Simulating a Single-server Queue*

This model uses random numbers to simulate a single-server queue with given interarrival and service time distributions, calculates waiting time and line statistics, and plots the waiting time distribution and line length.

### *Shuffling Elements of an Array*

A random shuffle of the elements in a data vector is provided.

### *Random Deviates with Exponential Distribution*

### *Normally Distributed Random Deviates*

### *Random Deviates with Weibull Distribution*

### *Uniformly Distributed Random Deviates*

### *Poisson Distributed Random Deviates*

These applications provide random deviates with exponential, normal, Weibull, uniform, and Poisson distribution and give a comparison plot of the deviates drawn and the target density function.

### *Combinatorial Formulas*

This model calculates binomial, multinomial, and multiset coefficients and rising and falling factorials.

### *Probability Distributions*

This application calculates values of the cumulative normal, chi-square, student's t, F and beta distributions and illustrates the use of MathCAD's root function to find percentage points.

## **Hardware and Software Requirements**

Each Statistics Applications Pack requires the following:

MathCAD 2.0 or above

IBM PC series, PS/2, or compatible computer  
with 640 Kb memory

Hercules, CGA, EGA, or VGA monitor

Apple SE, Plus or II with 1 Mb memory

A math coprocessor is recommended.

## **For More Information**

Designed to complement each other, the Statistics Applications Packs may be purchased separately or as a combination package. For more information about MathCAD or the applications pack series, see your local computer dealer or call 1-800-MathCAD (in Massachusetts, 617-577-1017).

All specifications subject to change.

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# MathSoft

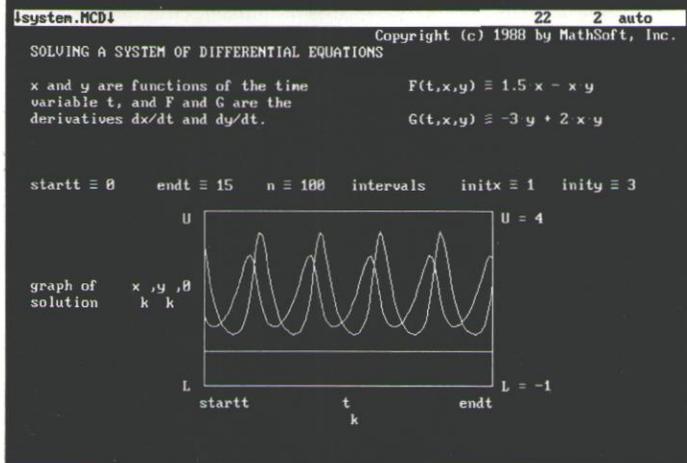
$\Sigma$  +  $\sqrt{\quad}$  - =  $\times$   $\int$   $\div$   $\delta$

### **MathSoft, Inc.**

One Kendall Square  
Cambridge  
Massachusetts  
02139

**(800) MATHCAD**

**(617) 577-1017**



# Advanced Math Applications Pack

With its unique user interface and easy to use format, MathCAD® has revolutionized the way engineers and technical professionals perform calculations on a personal computer. MathCAD lets you use a PC like a scratchpad, entering and calculating equations, creating plots, and adding and editing text.

## Sixteen Solutions for Specific Problems

The Advanced Math Applications Pack is a collection of sixteen mathematical models that increase the functionality of MathCAD by helping you solve specific problems. These applications let you explore a variety of MathCAD techniques with standard algorithms effective for a broad range of problems. You can use each application immediately to calculate results, or you can easily adapt it to solve other similar problems.

The Advanced Math Applications Pack includes software and complete documentation for sixteen frequently performed computational tasks. The documentation describes how to use each application and suggests ways to further customize it. The easy-to-use models let you start solving problems immediately. The applications include:

### *Solution of a First-order Differential Equation*

Using the fourth-order Runge-Kutta method, this application generates a numerical solution for a first-order ordinary differential equation and then plots the solution.

### *Solution of a Second-order Differential Equation*

This model finds a numerical solution for the equation

$$y''(t) + Ay'(t) + By(t) = C(t)$$

where A and B are real numbers and C is a real-valued function of t. MathCAD then plots the solutions of a given domain for chosen initial values of y and y'. You can adapt this model to solve other second-order equations including nonlinear ones.

### *Solution of a System of Differential Equations*

This model calculates and graphs the solution to a nonlinear system of two first-order differential equations.

### *Eigenvalues and Eigenvectors of a Symmetric Matrix*

The model calculates the eigenvalues of a real symmetric matrix by finding the roots of its characteristic polynomial. It then uses inverse iteration to find the corresponding eigenvectors.

### *Complex Eigenvalues and Eigenvectors*

A nonsymmetric matrix may have complex eigenvalues. Starting from an initial guess for one eigenvalue of a matrix, this application finds an eigenvalue and an associated eigenvector.

### *Convolution and Correlation of Sequences*

This model illustrates how to set up the convolution or correlation of two finite sequences.

### *The Discrete Fourier Transform in Two Dimensions*

By using a one-dimensional fast Fourier transform, this application computes the discrete Fourier transform of a square array.

### *Convolution Using FFTs*

This model calculates the approximate continuous convolution of two functions using the discrete Fourier transform.

### *Digital Filtering*

Using fast Fourier transforms, this model computes the convolution of a digital filter response function with an input sequence and then plots the filter, the input, and the output.

### *Conformal Mapping*

This model illustrates conformal mapping techniques by using complex functions to generate an airfoil shape and stream lines representing the steady irrotational flow of an ideal fluid around the airfoil.

### *Diffusion*

This model computes an approximate numerical solution to the diffusion equation.

### *The Laplace Equation*

Using a relaxation method, this application finds an approximate solution for the Laplace equation.

### *Coordinate Transformations*

This model performs and illustrates conversions between the rectangular, cylindrical, and spherical three-dimensional coordinate systems. It also includes the transformation between two-dimensional polar and rectangular coordinates.

### *Static Equilibrium: A Nonlinear System*

This model calculates and plots the equilibrium positions of a system of connected weights. It illustrates the use of a MathCAD solve block to solve a nonlinear system of equations.

### *Polynomial Least-squares Fit*

This model calculates the coefficients of the best fitting polynomial for given data and then plots the data points and graphs the polynomial on the same plot.

### *Plotting a Surface*

This model sketches the surface

$$z = f(x,y)$$

over a square domain centered at the origin. The plot models the surface by placing a dot at the appropriate height for each domain point.

## Hardware and Software Requirements

The Advanced Math Applications Pack requires the following:

MathCAD 2.0 or above

IBM PC series, PS/2, or compatible computer with 640 Kb memory

Hercules, CGA, EGA, or VGA monitor

Apple SE, Plus or II with 1 Mb memory

A math coprocessor is recommended.

## For More Information

For more information about MathCAD or the Advanced Math Applications Pack see your local computer software dealer or call 1-800-MathCAD (in Massachusetts, 617-577-1017).

All specifications subject to change.

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# Math Soft

Σ + √ - = × ∫ ÷ δ

### **MathSoft, Inc.**

One Kendall Square

Cambridge

Massachusetts

02139

**(800) MATHCAD**

**(617) 577-1017**



Special offer from MathSoft, Inc.  
May 1, 1989 - June 16, 1989

**MathCAD**

**Please answer the following questions:**

**Where did you hear about MathCAD?**

- Advertisement
- Review/Article
- Dealer
- Co-worker
- Friend
- \_\_\_\_\_

**Area of application (check one)**

- Mechanical Engineering
- Electrical Engineering
- Chemical Engineering
- Physical Sciences
- Financial/Econometric Analysis
- Aerospace Engineering

- Civil Engineering
- Industrial Engineering
- Natural Science
- Mathematics
- Computer Science
- Other \_\_\_\_\_

**Name 3 trade publications that you read regularly:**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**What other software packages have you purchased for your personal use?**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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- \_\_\_ ease of use
- \_\_\_ analytical power
- \_\_\_ graphics capabilities
- \_\_\_ reporting capabilities
- \_\_\_ price

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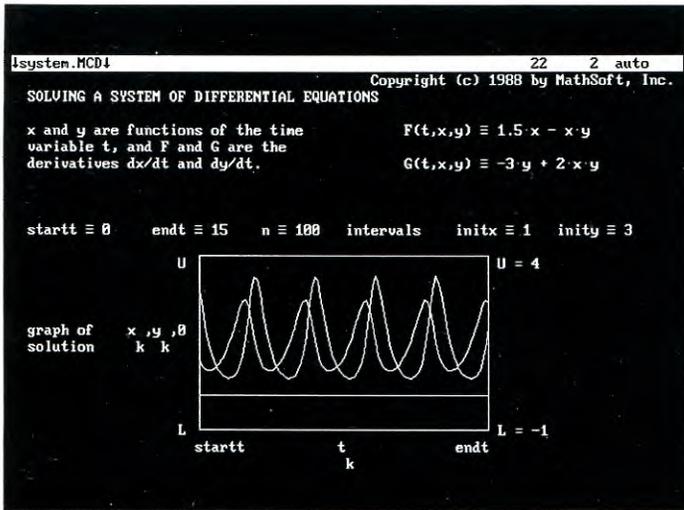
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2.5 2.5 **Upgrade Certificate** 2.5 2.5



# Advanced Math Applications Pack

With its unique user interface and easy to use format, MathCAD® has revolutionized the way engineers and technical professionals perform calculations on a personal computer. MathCAD lets you use a PC like a scratchpad, entering and calculating equations, creating plots, and adding and editing text.

## Sixteen Solutions for Specific Problems

The Advanced Math Applications Pack is a collection of sixteen mathematical models that increase the functionality of MathCAD by helping you solve specific problems. These applications let you explore a variety of MathCAD techniques with standard algorithms effective for a broad range of problems. You can use each application immediately to calculate results, or you can easily adapt it to solve other similar problems.

The Advanced Math Applications Pack includes software and complete documentation for sixteen frequently performed computational tasks. The documentation describes how to use each application and suggests ways to further customize it. The easy-to-use models let you start solving problems immediately. The applications include:

### *Solution of a First-order Differential Equation*

Using the fourth-order Runge-Kutta method, this application generates a numerical solution for a first-order ordinary differential equation and then plots the solution.

### *Solution of a Second-order Differential Equation*

This model finds a numerical solution for the equation

$$y''(t) + Ay'(t) + By(t) = C(t)$$

where A and B are real numbers and C is a real-valued function of t. MathCAD then plots the solutions of a given domain for chosen initial values of y and y'. You can adapt this model to solve other second-order equations including nonlinear ones.

### *Solution of a System of Differential Equations*

This model calculates and graphs the solution to a nonlinear system of two first-order differential equations.

### *Eigenvalues and Eigenvectors of a Symmetric Matrix*

The model calculates the eigenvalues of a real symmetric matrix by finding the roots of its characteristic polynomial. It then uses inverse iteration to find the corresponding eigenvectors.

### *Complex Eigenvalues and Eigenvectors*

A nonsymmetric matrix may have complex eigenvalues. Starting from an initial guess for one eigenvalue of a matrix, this application finds an eigenvalue and an associated eigenvector.

### *Convolution and Correlation of Sequences*

This model illustrates how to set up the convolution or correlation of two finite sequences.

### *The Discrete Fourier Transform in Two Dimensions*

By using a one-dimensional fast Fourier transform, this application computes the discrete Fourier transform of a square array.

### *Convolution Using FFTs*

This model calculates the approximate continuous convolution of two functions using the discrete Fourier transform.

### *Digital Filtering*

Using fast Fourier transforms, this model computes the convolution of a digital filter response function with an input sequence and then plots the filter, the input, and the output.

### *Conformal Mapping*

This model illustrates conformal mapping techniques by using complex functions to generate an airfoil shape and stream lines representing the steady irrotational flow of an ideal fluid around the airfoil.

### *Diffusion*

This model computes an approximate numerical solution to the diffusion equation.

### *The Laplace Equation*

Using a relaxation method, this application finds an approximate solution for the Laplace equation.

### *Coordinate Transformations*

This model performs and illustrates conversions between the rectangular, cylindrical, and spherical three-dimensional coordinate systems. It also includes the transformation between two-dimensional polar and rectangular coordinates.

### *Static Equilibrium: A Nonlinear System*

This model calculates and plots the equilibrium positions of a system of connected weights. It illustrates the use of a MathCAD solve block to solve a nonlinear system of equations.

### *Polynomial Least-squares Fit*

This model calculates the coefficients of the best fitting polynomial for given data and then plots the data points and graphs the polynomial on the same plot.

### *Plotting a Surface*

This model sketches the surface

$$z = f(x,y)$$

over a square domain centered at the origin. The plot models the surface by placing a dot at the appropriate height for each domain point.

## Hardware and Software Requirements

The Advanced Math Applications Pack requires the following:

MathCAD 2.0 or above

IBM PC series, PS/2, or compatible computer with 640 Kb memory

Hercules, CGA, EGA, or VGA monitor

Apple SE, Plus or II with 1 Mb memory

A math coprocessor is recommended.

## For More Information

For more information about MathCAD or the Advanced Math Applications Pack see your local computer software dealer or call 1-800-MathCAD (in Massachusetts, 617-577-1017).

All specifications subject to change.

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# Math Soft

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### **MathSoft, Inc.**

One Kendall Square

Cambridge

Massachusetts

02139

**(800) MATHCAD**

**(617) 577-1017**