

PTC Mathcad®

The single solution for engineering calculations

PTC Mathcad is the engineering notebook that manages your calculations and design intent. PTC Mathcad's live mathematical notation, units intelligence, and powerful calculation capabilities, presented within an easy-to-use interface, allows engineers and design teams to communicate their critical design and engineering knowledge.

PTC Mathcad does what spreadsheets, word processing, presentation software, and programming applications simply cannot do—it brings powerful calculation capabilities into human-readable form. It integrates these human-readable, live calculations with plots, graphs, text, and images into a single, interactive and professionally presented document. This ease and familiarity of an engineering notebook enables design exploration, validation, and verification, as well as the clear communication of critical engineering information. You don't need to be a PTC Mathcad expert to read and understand PTC Mathcad documents.

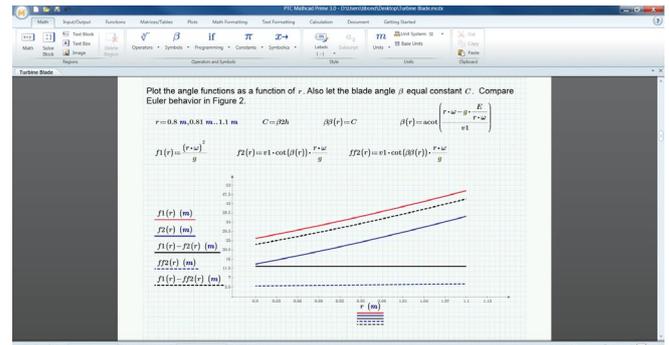
PTC Mathcad has significantly improved its calculation capability to allow bigger problems to be solved, faster. With hundreds of built-in mathematical functions and the unlimited ability to define your own, PTC Mathcad supports your advanced engineering design exploration requirements, including the ability to solve equations both numerically and symbolically, and the ability to solve complex systems of equations.

The result is a comprehensive tool allowing every engineer—from the casual user who simply needs to document the source of design parameters to the power user who needs to perform sophisticated design studies and trade-off analyses—to spend more of their time actually engineering.

How PTC Mathcad works

PTC Mathcad lets you type equations just as you would write them on a blackboard or read them in a reference book. There's no difficult programming language or syntax to learn; you simply type in your equations and see the results. You can use the equations to solve virtually any math problem you encounter, and you can place text anywhere on the worksheet to document your work.

PTC Mathcad also lets you easily set your preferred unit system and freely mix units of measure, ultimately maintaining dimensional integrity and preventing unit mistakes. You can work in your preferred unit system or switch to another system for a particular set of equations.



Live mathematical notation, units intelligence, and powerful calculation capabilities, all within an easy-to-use interface

PTC Mathcad simplifies and streamlines calculation documentation, which is critical to optimizing the design process and meeting product and project requirements and quality assurance standards. It combines equations, text, and graphics in a presentable format, making it easy to keep track of the most complex calculations for verification and validation. And when used in conjunction with PTC's Product Lifecycle Management (PLM) software, PTC Windchill®, and with PTC's Computer Aided Design (CAD) Software PTC Creo®, engineering calculations can be easily managed, standardized, and shared across the organization. This helps expedite knowledge capture, design review, and exchange of engineering knowledge.

Capabilities and specifications

Math editing

- Write equations using standard math notation
- Enter equations intuitively and naturally with the simple equation editor
- Use ribbon and/or keyboard entry
- Use standard operators for algebra, calculus, logic, linear algebra, and more
- Format math regions by altering text size, font, and color
- Format numeric result display settings including format and precision

$I_x = 325253 \text{ cm}^4$ $L = 15 \text{ m}$

$$y(x) := y_1 + \theta_1 \cdot x + \frac{M_1 \cdot x^2}{2 E \cdot I_x} + \frac{R_1 \cdot x^3}{6 E \cdot I_x}$$

$$y\left(\frac{L}{2}\right) = -2.642 \text{ mm}$$

$y(5 \cdot s) = ? \cdot \text{cm}$
 These units are not compatible.

Automatic unit checking and conversion with PTC Mathcad

Calculation

- Numeric evaluation
- Symbolic evaluation, operations, and solving
- Automatic update of results
- Single or multithreaded calculation
- Support for real and complex numbers

Document creation and editing

- Text regions, images, tables, plots, and equations combined in a single document
- Engineering paper-like grid for easy alignment of text and equations
- Collapsible areas to hide content and streamline the document presentation
- Standard text formatting options include text size, font, color, bullets, numbering, and alignment
- Customize headers and footers with text, images, page numbers, and file path location
- Find and replace in text and equations
- Toggle between page and draft views

Units management system

- Comprehensive unit support for numeric and symbolic calculations, functions, solve blocks, tables, vectors/matrices, and plots

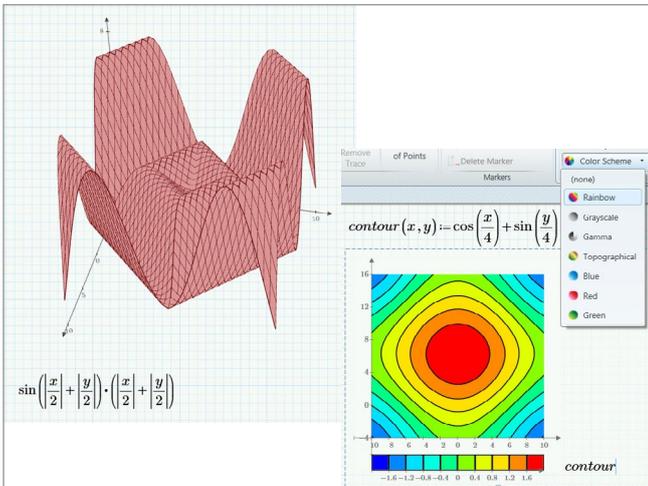
- Automatic unit checking and conversion
- Automatic unit simplification and highlighting
- Hundreds of predefined units and ability to easily create more
- Support for SI, USCS, and CGS unit systems

Functions

- General purpose, basic, and advanced functions
 - Trigonometric, hyperbolic, log, exponential, Bessel, Fourier transforms, number theory piecewise continuous, and calculus functions
- Probability and statistics
 - Probability density, probability distribution, statistics, and random number functions
- Curve fitting, smoothing, interpolation, and prediction
- Design of Experiments (DoE) functions
 - Design matrices, factor screening, ANOVA, and Monte Carlo simulation
- Custom functions:
 - Write STL, DXF, HDF5, and C++
 - Read and write to databases
- Other special applications:
 - Signal processing
 - Image processing
 - Wavelet

Plotting and graphing:

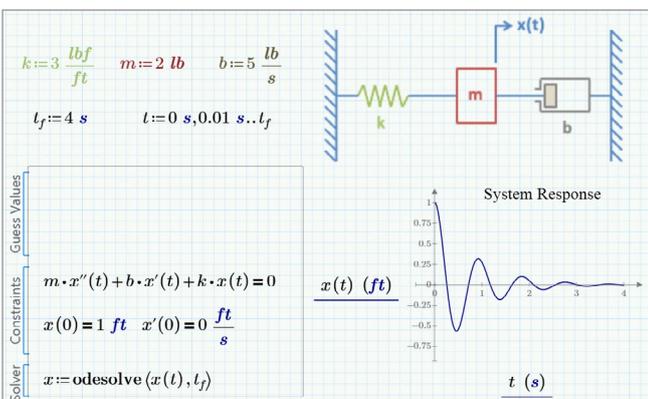
- XY plots: scatter, line, column, bar, stem, waterfall, error, box, and effects
- 3-D plots: scatter, surface, and curve
- Polar plots
- Contour plots



Complex plots and graphs can be created in PTC Mathcad.

Solving

- Multiple advanced solvers for linear and nonlinear systems of algebraic and differential equations
- Higher-level descriptive math in an easy-to-read textbook-like solve block format
- State-of-the-art algorithms for nonlinear optimization using the robust and powerful KNITRO[®] engine
- Support for parameterized modeling, enabling solutions to nested complex problems with seamless plot integration
- Ability to incorporate symbolic results into numerical functions



Easy-to-read textbook-like solve block format.

Vectors and matrices

- Linear algebra operators and functions
- Automatic, element-wise application for many functions and operators
- Easy and intuitive editing

Data

- Embedded Microsoft[®] Excel[®] component allows bidirectional integration with PTC Mathcad worksheet content
- Tables for defining parameters and constants
- Read and write functions supporting a variety of data formats (text, Excel, binary, image, etc.)
- Specialized data analysis and data manipulation functions

PTC Mathcad and PTC Creo integration

- PTC Mathcad Analysis Feature:
 - Bi-directionally link PTC Mathcad parameters to PTC Creo models
 - Verify and validate models against requirements
- Engineering Notebook, powered by PTC Mathcad:
 - Embed PTC Mathcad worksheets directly into a PTC Creo part or assembly
 - Store and save relevant engineering calculations and documentation with your PTC Creo models
 - Leverage PTC Mathcad values directly in the PTC Creo parameters tables

Programming

- Use familiar programming operators (for-loop, while-loop, if-then-else, etc.) to define functions of any complexity
- Seamless integration of equations within programs

User interface

- Task-oriented ribbon-based user interface
- Microsoft Office Fluent UI
- Extensive tool tips for all available functionality

Integration and interoperability:

- PTC Creo Parametric™
- PTC Windchill
- Open PTC Mathcad Prime 1.0, 2.0, and 3.0 worksheets
- Convert PTC Mathcad 7 through PTC Mathcad 15.0 using MCD, XMCD Converter
- Microsoft Excel 2003, 2007, 2010

Resources, help, and support:

- Integrated, context-sensitive help with live examples
- Integrated access to the PTC Learning Connector
- PTC standard and sustained Global Support program
- PTC online community
- Extensive library of pre-built worksheets

Language support

- English, French, German, Japanese, Italian, Spanish, Korean, Russian, and Chinese (Simplified and Traditional)

Platform support and system requirements

- 64-bit or 32-bit versions available for Windows® 7 and Windows 8.1

For more information, visit: [PTC.com/go/mathcad](https://www.ptc.com/go/mathcad)

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