ptc

ptc mathcad®

Migration Guide

12.0.0.0

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Contents

About This Guide

This Migration Guide is intended for users of the previous versions of Mathcad who are migrating to PTC Mathcad Prime.

How to Use This Guide

This guide supplements the PTC Mathcad Help Center. This guide assumes you are already familiar with PTC Mathcad functionality.

Use this guide to learn about converting your files from earlier versions of Mathcad to PTC Mathcad Prime. Step-by-step procedures are provided here for converting your legacy worksheets to PTC Mathcad Prime worksheets. Information on troubleshooting file conversion issues is also given.

Technical Support

Contact PTC Technical Support via the PTC Web site, phone, fax, or e-mail if you encounter problems using your software. For more information, see Opening and Tracking a Call to Technical Support in the *PTC Customer Service Guide* enclosed with your shipment. The guide is also on the PTC Support web page at https://www.ptc.com/support/csguide/Contact.

You must have a Service Contract Number (SCN) before you can receive technical support. If you do not have a number, contact PTC License Management using the instructions in your *PTC Customer Service Guide* under License Management. You can receive free technical support for the first 30 days after purchasing new software from PTC. If you do not have a SCN, you can contact technical and licensing support at https://www.ptc.com/support/csguide/Contact.

If you run into issues with installation or licensing, and need further assistance, go to https://support.ptc.com/support/mathcad_supportCenterOpt.htm.

Documentation

PTC provides documentation on the product CD-ROM in the following forms:

- Help Center with context-sensitive help and tutorials
- *PTC Mathcad Prime 12.0.0.0 Read This First* in PDF format

To access the Help Center or the Getting Started Tutorial, click  or press F1. You can also click any item on the user interface Ribbon or any function in the worksheet and press F1 to open the relevant Help topic.

Feedback to Documentation

PTC welcomes your suggestions and comments on its documentation—send feedback to the following address:

mathcad-documentation@ptc.com

Please include the name of the application and its release with your comments.

Documentation Conventions

Convention	Item	Example
Bold	Buttons and other selectable elements or options from the Ribbon	Click **Calculation** ▸ **Calculation Options**. Click **Approximate Equality**.
Courier	User input, system messages, directories, and file names	`Processing completed.`
Courier with less-than and greater-than symbols (< >)	Variables for which the user substitutes an appropriate value	`output=<25`

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Converting Legacy Files

Legacy files are worksheets and templates that were created using previous versions of PTC Mathcad Prime. You cannot open such legacy files directly in PTC Mathcad Prime 12.0.0.0. However, you can use the PTC Mathcad Prime 12.0.0.0 **XMCD, MCD Converter** to convert `.mcd`, `.xmcd`, and `.xmcdz` legacy worksheets to `.mcdx` format. You can also use the converter to convert legacy `.mct` and `.xmct` template files to PTC Mathcad Prime 12.0.0.0 `.mctx` format.

This chapter provides instructions for using the converter.

Using the XMCD, MCD Converter

1. To start the XMCD, MCD Converter, on the **Input/Output** tab, in the **PTC Mathcad Worksheets** group, click **XMCD, MCD Converter**. The converter opens.

   Alternatively, you can start it from the **Start** menu.
2. Click **Add Worksheets**. The **Open** dialog box opens.
3. Browse for and select the legacy worksheets, and then click **Open**. The file names that you selected, with their full path, appear in the **Source Worksheet** column. The version of Mathcad you used to create the legacy worksheet appears in the **Version** column.
4. Click **Add References**. If the worksheet contains references to other worksheets, they appear in the converter.
5. Click **Save as HTML** to convert the worksheet into `.html` format. The conversion process starts and the **HTML Status** changes to **In Progress** .If the conversion is successful, the **Status** changes to **Saved**, otherwise it changes to **Failed**.
6. Select the desired worksheets and click **Convert**. The conversion process starts and the **MCDX Status** changes to **In Progress**. If the conversion is successful, the **Status** changes to **Converted**, otherwise it changes to **Failed**.

   For each successful conversion, the converter creates a new file with a `.mcdx` file extension in the same folder as the source file. The source file is not modified.

   The XMCD, MCD Converter displays a conversion log that lists all the issues found during conversion. Click a worksheet name to see its log. The XMCD, MCD Converter stores all the log files in the directory that contains your legacy files. You can open log files with a text editor like Notepad or an XML editor.
7. To open the converted worksheet, right-click the line and select one of the opening options.
8. Open a converted worksheet and then press Ctrl+F5 to recalculate the worksheet and view the updated results.

Note

- The worksheets generated by the XMCD, MCD Converter cannot be read by previous versions of PTC Mathcad Prime.
- You can continue working in PTC Mathcad Prime 12.0.0.0 while files are being converted.

Understanding the Conversion Results

When you convert legacy worksheets, all regions that require your attention are annotated. A red line segment appears to the left of the affected region and a red arrow points to the affected region. For example, a region might contain a function with different solving algorithm, a different display, or a feature that is unsupported in PTC Mathcad Prime 12.0.0.0. Features that are not available in PTC Mathcad Prime 12.0.0.0 are converted as images, so that no information is lost. All annotated differences belong to one of the following categories:

- Display differences
- Calculation differences
- Unsupported features and formatting (not available in PTC Mathcad Prime 12.0.0.0)

To understand and handle annotated regions, perform the following steps:

1. In a converted worksheet, click an annotated region. The annotation appears below the region.
2. Read the annotation message and resolve any conversion issues.
3. After you edit all the annotated regions, on the **Input/Output** tab, in the **PTC Mathcad Worksheets** group, click **Clear Annotations**. The annotation marks disappear.

> **Note**
>
> **Clear Annotations** removes all the annotations in the worksheet at once. Do not click this button until you have reviewed all the issues.

Refer to Resolving Conversion Issues for information on resolving conversion issues.

Display Differences

The display of some features is different in PTC Mathcad Prime 12.0.0.0. These display differences do not affect calculation results.

OLE Objects

Converted OLE objects have the setting “Preserve Aspect Ratio” turned ON by default.

OLE objects that were displayed as an icon in the legacy worksheet might loose their aspect ratio upon conversion.

Fractional Results and Mixed Number Formatting

The result is formatted according to the default PTC Mathcad Prime 12.0.0.0 worksheet style.

Complex Numbers

In previous versions of Mathcad, you entered z:=2π*1i and the displayed result was z:=2π*i, but in PTC Mathcad Prime 12.0.0.0 the displayed result is z:=2π*1i (the imaginary unit is prefixed with the number 1). A new polar operator allows you to display complex results in polar form.

Parentheses

Some parentheses in previous versions of Mathcad that are only used for display purposes are not converted. For example, consider the following equation:

$$Q(i,j) := m_{(i,j)} + n_{(j,i)}$$

Subscripts appear without parentheses when converted by PTC Mathcad Prime 12.0.0.0:

$$Q(i,j) := m_{i,j} + n_{j,i}$$

The meaning of the resulting equation is identical.

Spaces in Variable Names

In previous versions of Mathcad, you can have spaces in variable names. When converted by PTC Mathcad Prime 12.0.0.0, each space is replaced by an underscore:

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
$\mathrm{fa\ b\ c} := 20$	$fa\_b\_c := 20$
$\mathrm{f_{y\ abc}} := 30$	$f_{y\_abc} := 30$

Display Precision in Results

PTC Mathcad Prime 12.0.0.0 can display up to 15 decimal places in results. This affects the conversion of results.

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
$\ln(2) = 0.69314718055994530$ Displays 17 decimal places	$\ln(2) = 0.693147180559945$ Displays 15 decimal places

Note

The precision of internal results is the same.

Derivatives

The display of partial derivatives is not supported in PTC Mathcad Prime 12.0.0.0. They appear as derivative operators.

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
$\frac{\partial}{\partial y_j} f_i$	$\frac{d}{dy_j} f_i$

Note

The partial derivative variables use literal subscripts.

Symbolic Evaluation

When you open a converted worksheet that contains symbolic evaluations, the following warning message is displayed in the status bar:

This document was created with a prior version of PTC Mathcad Prime and contains symbolic evaluation. PTC Mathcad Prime 12.0.0.0 uses new symbolic engine and results of symbolic evaluation may look different. Read more about symbolic engine changes.

Note

- Click the warning message link for more information about the new symbolic engine, or dismiss the message.
- The shown converted symbolic results are the output of the legacy symbolic engine. To see the PTC Mathcad Prime 12.0.0.0 symbolic results, click **Calculate** or press Ctrl+F5 to recalculate the worksheet.

- Stacking of Symbolic Keywords and Modifiers

  In previous versions of Mathcad, the keyword and modifier placeholders are to the left of the symbolic evaluation operator. In PTC Mathcad Prime 12.0.0.0, they are above it.

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
$e^{x}\left\vert \begin{array}{l}\text{series}\\ \text{substitute},x=2\end{array}\right.\rightarrow \frac{109}{15}$	$e^{x}\ \begin{array}{l}series\\ substitute,x=2\end{array}\ \rightarrow \frac{109}{15}$

  The displayed results, before and after recalculation, are identical.

- Programming Operator

  The display of PTC Mathcad Prime 12.0.0.0 symbolic evaluation results containing programming operators appears slightly different.

Previous versions of Mathcad
$(3a-7)\cdot x=1\ \text{solve},x,\text{fully}\ \rightarrow \left\vert \begin{array}{ll}\frac{1}{3\cdot a-7} & \text{if } a\neq \frac{7}{3}\\ \text{undefined} & \text{if } a=\frac{7}{3}\end{array}\right.$

PTC Mathcad Prime 12.0.0.0 (Before recalculation)

$$(3\ a-7)\ x=1 \xrightarrow{solve,x,fully} \begin{cases} \text{if } a\neq\frac{7}{3} \\ \quad \frac{1}{3\cdot a-7} \\ \text{else if } a=\frac{7}{3} \\ \quad undefined \end{cases}$$

PTC Mathcad Prime 12.0.0.0 (After recalculation)

$$(3\cdot a-7)\cdot x=1 \xrightarrow{solve,x,fully} \begin{cases} \text{if } a\neq\frac{7}{3} \\ \quad \frac{1}{3\cdot a-7} \\ \text{else} \\ \quad undefined \end{cases}$$

The displayed results, before and after recalculation, are different.

- Collapsed Nested Matrices

  PTC Mathcad Prime 12.0.0.0 does not support the display of collapsed nested matrices in symbolic evaluation results.

Previous versions of Mathcad

$$m1 := \begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix} \qquad m2 := \begin{pmatrix} 5 & 7 \\ 6 & 8 \end{pmatrix}$$

$$m4 := (m1\ \ m2) \rightarrow (\{2,2\}\ \ \{2,2\}) = (\{2,2\}\ \ \{2,2\})$$

PTC Mathcad Prime 12.0.0.0

$$m1 := \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix} \quad m2 := \begin{bmatrix} 5 & 7 \\ 6 & 8 \end{bmatrix}$$

$$m4 := [m1\ \ m2] \rightarrow \left[\begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}\ \begin{bmatrix} 5 & 7 \\ 6 & 8 \end{bmatrix}\right] = [[2\times 2]\ \ [2\times 2]]$$

The displayed results, before and after recalculation, are identical.

- Long Symbolic Results

  In previous versions of Mathcad, long symbolic results are displayed fully and you must scroll to the right to see the full result. PTC Mathcad Prime 12.0.0.0 truncates the display of long results and places three ellipses at the truncation point. Clicking the math region displays a resize bar for making the region width smaller or larger.

- Symbolic Expressions or Keywords

  Unlike previous versions of Mathcad, PTC Mathcad Prime 12.0.0.0 does not support the hiding of left-hand side expressions.

- Symbolic Expressions Using the *assume* Keyword

  The converter modifies the *assume=real* keyword to *assume,ALL=real* modifier:

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
$\left(2^{b}\right)^{c}$ simplify, assume = real $\rightarrow 2^{b \cdot c}$	$\left(2^{b}\right)^{c} \xrightarrow{simplify,\, assume,\, ALL = real} 2^{b \cdot c}$

  The displayed results, before and after recalculation, are identical.

Data Tables

In previous versions of Mathcad, data tables are used to define data sets. The table elements are entered directly by the user or imported from a file. If the table is not resized, then the display shows only the first ten elements along with three horizontal ellipses if there are more elements in the table. PTC Mathcad Prime 12.0.0.0 converts legacy data tables to matrices and the display of such matrices shows the first twelve elements along with three vertical ellipses if there are more elements in the matrix.

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0

T2 :=

	0	1
0	0	0
1	4.292	4.292
2	8.584	8.584
3	12.875	12.875
4	17.167	17.167
5	21.459	21.459
6	25.751	25.751
7	30.042	30.042
8	34.334	34.334
9	38.626	...

$$T2 := \begin{bmatrix} 0 & 0 \\ 4.2918 & 4.2918 \\ 8.5835 & 8.5835 \\ 12.8753 & 12.8753 \\ 17.1671 & 17.1671 \\ 21.4588 & 21.4588 \\ 25.7506 & 25.7506 \\ 30.0424 & 30.0424 \\ 34.3341 & 34.3341 \\ 38.6259 & 38.6259 \\ 42.9177 & 42.9177 \\ 47.2095 & 47.2095 \\ & \vdots \end{bmatrix}$$

Input Tables

In PTC Mathcad 15.0 and earlier versions, input tables are created in assignment expressions that have an index on the left-hand side and a comma on the right-hand side of assignment.

After entering the second input, the input sequence is automatically converted to a table. Here is an example of PTC Mathcad 15.0 worksheet with two input tables.

ORIGIN = 1

i := 6..11 j := 3..5

$M_i :=$

2900
3900

$O_{i,j} :=$

21
22
23
24

M =

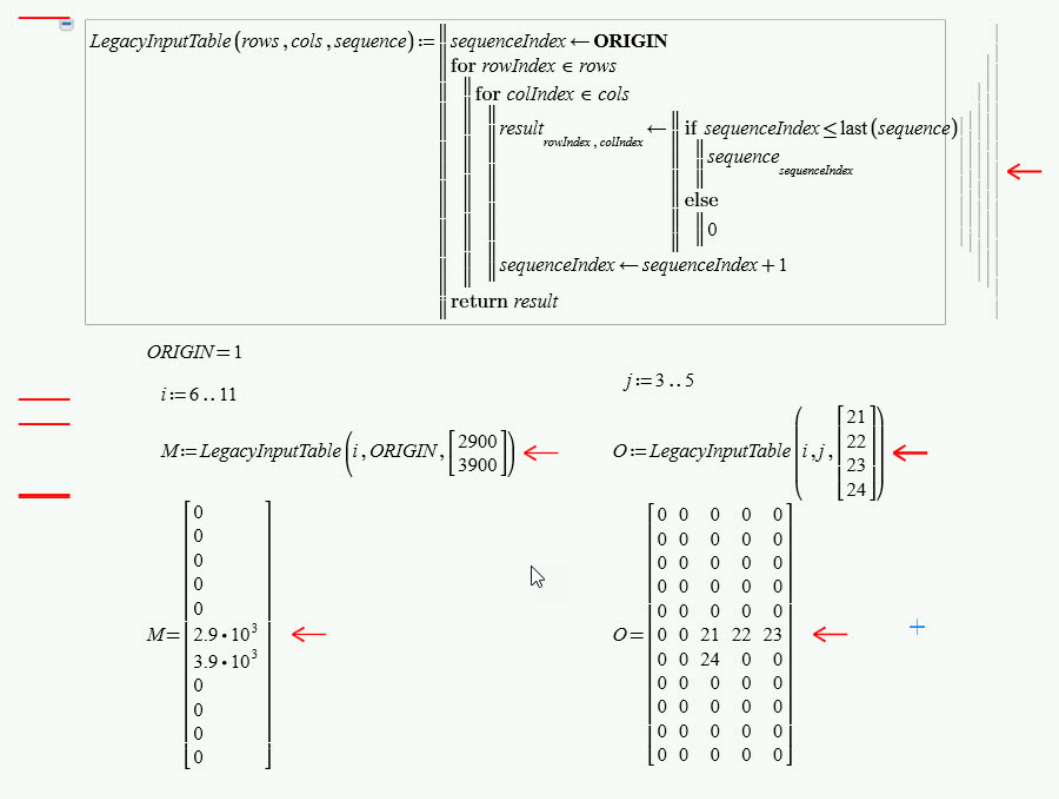
	1
1	0
2	0
3	0
4	0
5	0
6	$2.9 \cdot 10^3$
7	$3.9 \cdot 10^3$
8	0
9	0
10	0
11	0

O =

	1	2	3	4	5
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	21	22	23
7	0	0	24	0	0
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0

PTC Mathcad Prime 12.0.0.0 does not have input tables. Tables are converted to matrices.

The `LegacyInputTable` function is added to the converted worksheet to simulate the behavior of legacy input tables in PTC Mathcad Prime 12.0.0.0.



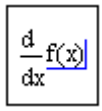
Operators with Multiple Forms

Some operators have multiple forms in previous versions of Mathcad. PTC Mathcad Prime 12.0.0.0 uses a single operator with multiple placeholders, to make it easier to use whichever form you want. The additional placeholders can be filled in or left empty.

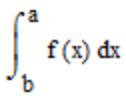
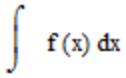
- Square root and Nth root

Previous versions of Mathcad		PTC Mathcad Prime 12.0.0.0	
Square Root	$\sqrt{3} = 1.732$	Insert both the Square Root and Nth Root operators by pressing /	$\sqrt{3} = 1.732$
Nth Root	$\sqrt[2]{3} = 1.732$		$\sqrt[2]{3} = 1.732$

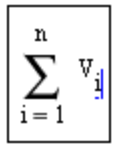
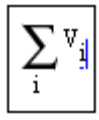
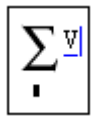
- Derivative and Nth derivative

Previous versions of Mathcad		PTC Mathcad Prime 12.0.0.0	
Derivative		Insert both forms of the derivative operator by pressing: Ctrl+Shift+D	$\frac{d}{dx}f(x)$
Nth Derivative			$\frac{d^2}{dx^2}f(x)$

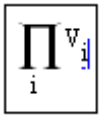
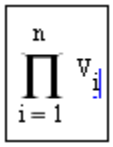
- Definite integral and indefinite integral

Previous versions of Mathcad		PTC Mathcad Prime 12.0.0.0	
Definite integral		Insert both forms of the integral operator by pressing: Ctrl+Shift+I	$\int_b^a f(x)\,dx$
Indefinite integral			$\int f(x)\,dx$

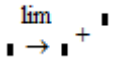
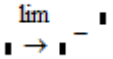
- Summation

Previous versions of Mathcad		PTC Mathcad Prime 12.0.0.0	
Summation		Insert the three forms of the Summation operator by pressing: Ctrl+Shift+$	$\sum_{i=1}^{n} V_i$
Range Variable Summation			$\sum_i V_i$
			$\sum V$

- Product

Previous versions of Mathcad		PTC Mathcad Prime 12.0.0.0	
Range Variable Iterated Product		Insert both forms of the Product operator by pressing: Ctrl+Shift+#	
Iterated Product			

- Limit

Previous versions of Mathcad		PTC Mathcad Prime 12.0.0.0	
Two-sided limit		Insert all three forms of the limit operator by pressing: Ctrl+L	
Right-hand limit			
Left-hand limit			

- Symbolic Evaluation

Previous versions of Mathcad		PTC Mathcad Prime 12.0.0.0	
Symbolic Evaluation		Insert both forms of the symbolic operator by pressing: Ctrl+. (period)	
Symbolic Keyword Evaluation			

WRITEPRN and APPENDPRN Functions

The **WRITEPRN** and **APPENDPRN** functions are converted into different PTC Mathcad Prime 12.0.0.0 formats.

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
$M := \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix}$	$M := \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$
WRITEPRN("bob") := M	$\text{WRITEPRN}(\text{“bob”}, M) = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$
$\text{READPRN("bob.prn")} = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix}$	$\text{READPRN}(\text{“bob.prn”}) = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
APPENDPRN("bob") := M	$\text{APPENDPRN}(\text{“bob”}, M) = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$
$\text{READPRN("bob.prn")} = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix}$	$\text{READPRN}(\text{“bob.prn”}) = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$

PTC Mathcad Prime 12.0.0.0 converts the definitions WRITEPRN(“file”):=M and APPENDPRN(“file”):=M to WRITEPRN(”file”, M)= and APPENDPRN(”file”, M)= respectively.

WRITECSV and WRITEEXCEL Functions

The **WRITECSV** and **WRITEEXCEL** functions are converted into different PTC Mathcad Prime 12.0.0.0 formats.

Previous versions of Mathcad
$\text{WRITECSV(M, "excelcsvMC15.xlsx")} = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix}$
$\text{WRITEEXCEL(M, "excelMC15.xlsx")} = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix}$

PTC Mathcad Prime 12.0.0.0
$\text{WRITECSV}(\text{“excelcsvMC15.xlsx”}, M) = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$
$\text{WRITEEXCEL}(\text{“excelMC15.xlsx”}, M) = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$

PTC Mathcad Prime 12.0.0.0 swaps the first two arguments.

Excel Components

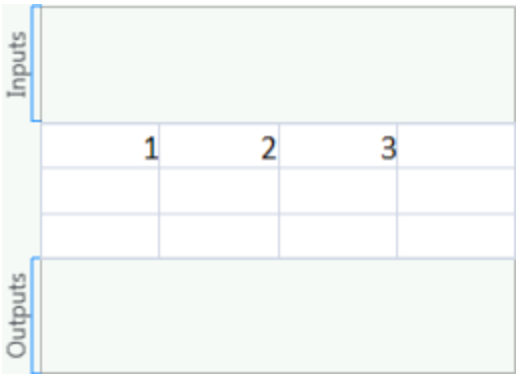
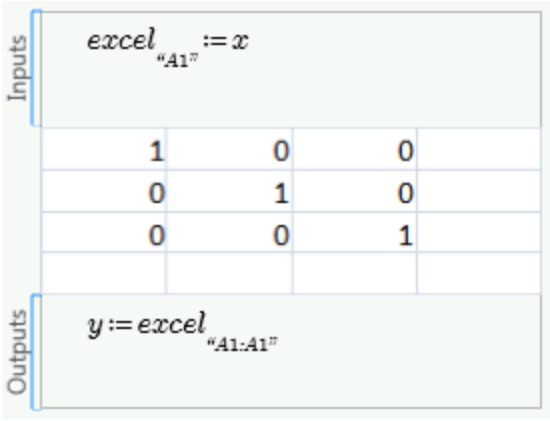
Excel components have a new format in PTC Mathcad Prime 12.0.0.0. When you convert a legacy Excel component, the converter adds input and output expressions to fit the new format.

Whether created from an external file or from typing in data, Excel components are treated identically by the converter. If the converted Excel component is linked to an external file, the converter embeds the data inside the Excel component. The converted worksheet is not linked to the external file.

An Excel component that is displayed as an icon in previous versions of Mathcad is converted to an Excel component with a single cell displayed.

Note

For the supported versions of Excel, refer to the *Platform Support* document on *PTC.com*.

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
Excel component with no inputs and outputs. 1 2 3	Excel component with empty **Inputs** area and **Outputs** area. 
Excel component with inputs and outputs. *x* is the input variable. *y* is the output variable. y := 1 0 0 0 1 0 0 0 1 x	The inputs and outputs are converted to input and output expressions. 

Other notable differences for Excel components are listed here:

- In previous versions of Mathcad, when you open the Excel component table, the Excel ribbon is a part of the Mathcad menu. In PTC Mathcad Prime 12.0.0.0, a separate Excel window opens to show the full Excel component table.
- If a component table in the legacy file contains the value of *NaN*, the converter changes the cell's value to blank. Like any other blank cell, if you assign a blank cell to an output variable, its value is 0.

- PTC Mathcad Prime 12.0.0.0 does not support the use of an Excel component to define functions. If a legacy file contains a function definition that depends on an Excel component, the conversion fails.

Converted Text

Text is converted properly when your display is set to 96 DPI. If your display is set to 120 DPI, then the converted file might contain text that wraps onto more than one line.

Disabled Regions

In legacy files a disabled region is marked with a black square. When converted, the disabled region appears grayed out.

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
D := "Disabled Legacy Math Region" ■	D := "Disabled Legacy Math Region"

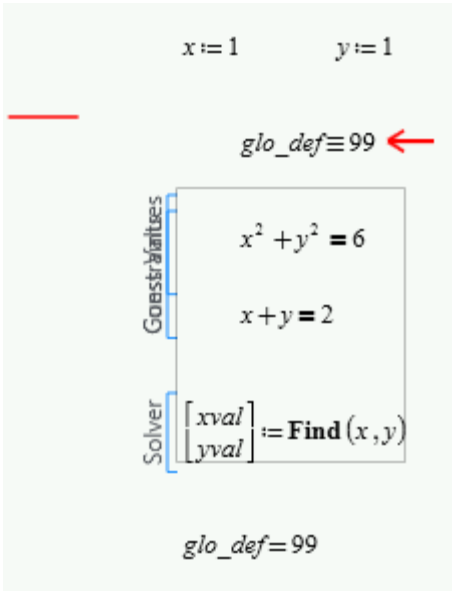
Page Layout

You can view the PTC Mathcad Prime 12.0.0.0 worksheet with or without grid lines. By default PTC Mathcad Prime 12.0.0.0 opens in page view in which your worksheet appears as a series of pages with grid lines. The nonprintable continuous space that is visible on the right side of the legacy Mathcad worksheets is hidden. To view the nonprintable space, click the **Draft View** icon  in the bottom right of the status bar or under the **Document** tab. To view a print preview of your worksheet, click the **Page View** icon  . If you want to make your page view larger, choose a different page size or adjust the margins under the **Document** tab. You can also preview your pages by saving them to XPS (XML Paper Specification) or printing them to PDF directly from PTC Mathcad Prime 12.0.0.0.

Global Definition Operator

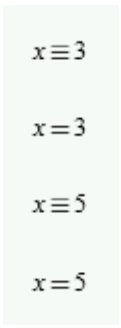
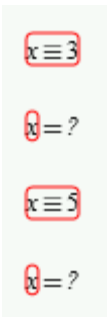
Legacy Mathcad allows the use of multiple global definitions of the same variable, including inside solve blocks. PTC Mathcad Prime 12.0.0.0 limits you to a single global definition of the same variable and it must be placed outside solve blocks.

- If your legacy worksheet has a global definition operator inside a solve block, then upon conversion the global definition operator is moved to outside the solve block.

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
x := 1 y := 1 Given glo_def ≡ 99 $x^2 + y^2 = 6$ x + y = 2 $\begin{pmatrix} xval \\ yval \end{pmatrix}$:= Find(x,y) glo_def = 99	

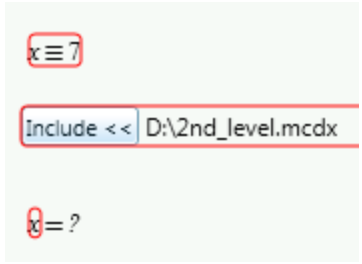
The converted worksheet has no errors. Read the annotation message before clearing it.

- If your legacy worksheet has multiple global definitions of the same variable, then opening the converted file shows no errors. However, if you recalculate the worksheet, then the two global definitions and their two evaluations report errors.

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0	
x ≡ 3 x = 3 x ≡ 5 x = 5		

The converted worksheet has errors. Resolve the issue by removing the extra global definition operators.

- If your legacy worksheet contains a global definition of a variable and a reference to another worksheet that contains a global definition of the same variable, then upon conversion and recalculation an error is flagged by all regions.

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
x ≡ 7 Reference:D:\2nd_level.xmcd(R) x = 3	

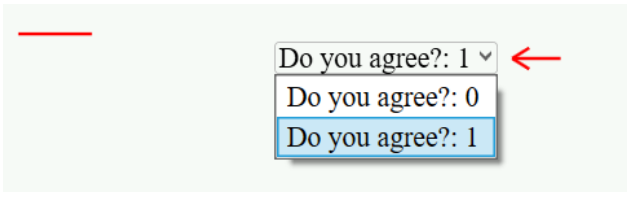
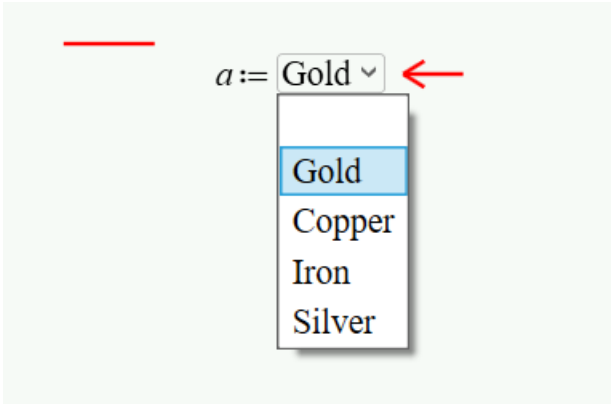
The converted worksheet has errors. To resolve the issue you must open the included worksheet to decide which of the global definition operators you should remove.

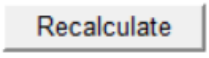
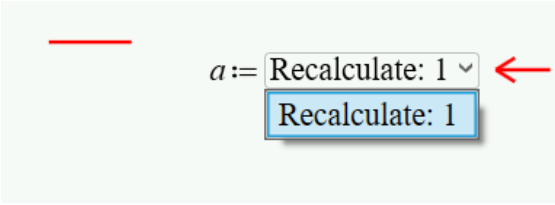
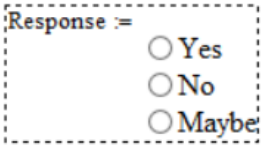
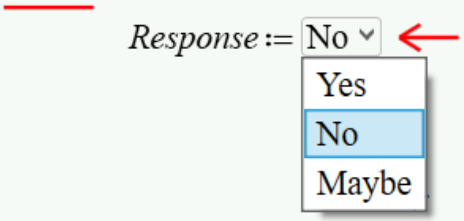
Equation Break Operator

PTC Mathcad Prime 12.0.0.0 supports equation breaking but does not support the insertion of equation break operators in range variables.

Web Controls

PTC Mathcad Prime 12.0.0.0 supports conversion of web controls.

Previous Versions of Mathcad	PTC Mathcad Prime 12.0.0.0
☑ Do you agree?	
a := Gold Copper Iron Silver	

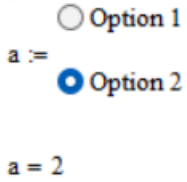
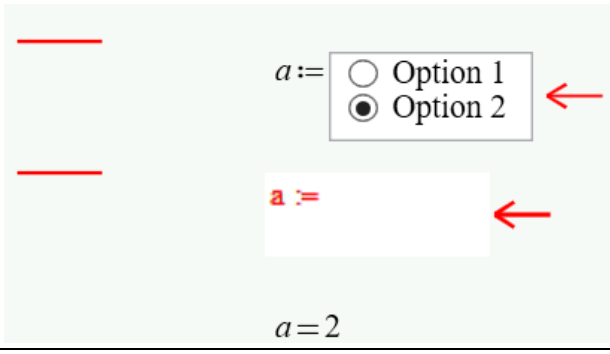
Previous Versions of Mathcad	PTC Mathcad Prime 12.0.0.0
	
	

Note

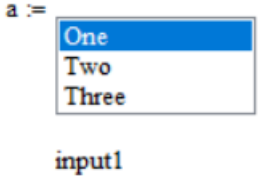
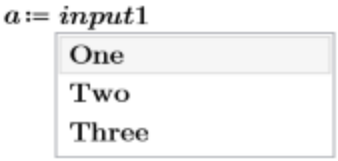
Web control conversion does not support text boxes. It converts the text box to an image.

Advanced Controls — Radio Button

PTC Mathcad Prime 12.0.0.0 supports the conversion of **Radio Button** groups from previous versions of Mathcad. After the conversion the buttons are part of one single control with multiple selections, while in previous versions of Mathcad they appeared as multiple radio buttons with a single selection. An annotated image is created in the PTC Mathcad Prime 12.0.0.0 worksheet to indicate the position of the radio buttons in the legacy Mathcad worksheet. You can delete this image.

Previous Versions of Mathcad	PTC Mathcad Prime 12.0.0.0
	

The placement of the inputs field changed in PTC Mathcad Prime 12.0.0.0 compared to legacy Mathcad.

Previous Versions of Mathcad	PTC Mathcad Prime 12.0.0.0
	

Calculation Differences

TOL and CTOL

PTC Mathcad Prime 12.0.0.0 uses the *KNITRO* optimization solvers. This means that tolerances for solve block functions **find**, **minerr**, **minimize** and **maximize** are set internally. Unlike previous versions of Mathcad, you no longer need to set *TOL* in a solve block.

Note

With PTC Mathcad Prime 12.0.0.0 the *KNITRO* optimization solver sets the tolerances internally when you use functions **minimize** and **maximize** outside a solve block.

CTOL continues to control the constraint satisfaction tolerance for functions **find** and **minerr**.

Clearing the Previous Value of a Variable

In previous versions of Mathcad, the expression $x:=x$ was used to clear the previous symbolic value of x while leaving the numeric value intact. The **XMCD, MCD Converter** converts the legacy expression $x:=x$ to the new PTC Mathcad Prime 12.0.0.0 function $\mathbf{clear_{sym}(x)}$.

Units

PTC Mathcad Prime 12.0.0.0 has dynamic unit checking. This means that units are checked while functions are processed. In Mathcad 12 through 15, units are checked first and then processed.

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
$f(x) := 1 + m$ $f(1) =$	$f(x) := 1 + m$ $f(1) = ?$
An error on the function definition indicates that the units do not match.	An error only appears after the function is evaluated.

Dynamic checking gives more flexibility, so some expressions that produce an error in earlier versions of Mathcad work properly in PTC Mathcad Prime 12.0.0.0. For example, in Mathcad 12 through 15, you cannot define a program or function that depends on a numeric value to determine the units of output.

$$f2(x) := \begin{cases} cm^2 & \text{if } x < 0 \\ cm^3 & \text{otherwise} \end{cases}$$

But in PTC Mathcad Prime 12.0.0.0, the program works as expected:

$$f2(x) := \text{if } x < 0 \;\; cm^2 \;\; \text{else} \;\; cm^3$$

Note

This program contains the if/else operator, which replaces if/otherwise.

Solve Blocks

Solve blocks in PTC Mathcad Prime 12.0.0.0 are clearly defined regions within a solve block box. You do not need the word *Given* to mark the start of a solve block. Guess values, constraints, and solvers are labeled for clarity. All regions inside the solve block construct can move as one unit. For more information on solve blocks, refer to the Help and the Solving Tutorial for PTC Mathcad Prime 12.0.0.0.

The following restrictions apply to solve blocks:

- You cannot use a global definition operator inside a solve block.

- You cannot include a range loop above the solver function inside a solve block. You can have a range variable but not a range loop such as this:

$$i := 1 .. 10$$

$$x_i := i$$

- You cannot include any definitions inside an ODE solve block, that is, a solve block containing **odesolve**.
- PTC Mathcad Prime 12.0.0.0 does not support symbolic evaluation of functions inside solve blocks. If your legacy worksheet contains symbolic evaluations then upon conversion they are moved outside the solve block.

Worksheet Calculation

Earlier versions of Mathcad open by recalculating all results, and you can choose to save the file with results stored or unstored.

PTC Mathcad Prime 12.0.0.0 does not recalculate the results when you first open the file, so if results were stored, they will show in the file. When you edit a file, the results are recalculated. When you edit results, the results are always recalculated.

Advanced Controls

- After conversion of a Mathcad legacy worksheet, perform the following process the first time you open the file with PTC Mathcad Prime 12.0.0.0:

  1. Go to  ▸ **Options** and select **Run Advanced Control script on worksheet recalculate**.
  2. Click **Calculation** ▸ **Controls** ▸ **Calculate**.
  3. Alternatively, interact with each advanced control on the worksheet (e.g. change a selection on a list box, click a button, or change a text in a text box). This step is recommended if you do not want to enable the **Run Advanced Control script on worksheet recalculate** option.
  4. Save the changes.

- When the control does not have an output variable and the inputs are in array format, when the script accesses those inputs, an input validation is required. Add the line below to your script:

  - VBScript
    ```
    If IsArray(Inputs(0).value) = False Then Exit Sub
    ```
  - JScript
    ```
    if (!Inputs[0].Value.length) return;
    ```

Alternatively, add an output variable to the control.

- Complex numbers are not supported with **Advanced Controls** in PTC Mathcad Prime. The properties that get or set complex numbers are inactive, with the following behavior: `IValue` returns `null`, with no error on the script. `IsComplex` returns an error on the script.

Scripting and Syntax differences in Advanced Controls

- In previous versions of Mathcad, the events for Jscript had the following syntax:

```
function MyEventSrc::Event1()
{
// add your code here
}
```

  This syntax was updated in PTC Mathcad Prime 12.0.0.0 by replacing the double colon (::) with an underscore (_). Here is the updated syntax:

```
function MyEventSrc_Event1()
{
// add your code here
}
```

  If you used the double colon syntax in the legacy Mathcad worksheets, after conversion the script will interpret this symbol as an underscore and the script will continue to work. Consider replacing the symbol used in the Mathcad legacy script with an underscore.
- In Mathcad legacy scripts created with JScript you could only access the inputs and outputs of the control in the `Exec` event or using the `Worksheet` class. To facilitate direct access to these parameters, in PTC Mathcad Prime 12.0.0.0, all the JScript events have parameters. After you convert a Mathcad legacy script, make sure to add the arguments to the events.
- In PTC Mathcad Prime 12.0.0.0, in scripts that are created with VBScript, all events have parameters. After you convert a Mathcad legacy script, it is not mandatory to add arguments to each event.

Inactive Properties, Methods and Events in Advanced Controls

In PTC Mathcad Prime 12.0.0.0, some of the properties, methods and events that were available in legacy Mathcad are inactive. This means that after conversion, if the script contains one or more lines that access such a property, the script will continue to run, but that property will not work or have any effect on the control.

The following table contains the list of inactive properties, methods and events:

Formatting Properties	State Properties	Methods	Events
List Box			
`Border`	`LBERRSPACE`	`Recalculate`	`Error`

Formatting Properties	State Properties	Methods	Events
ClientEdge DisableNoScroll HorizontalScroll VerticalScroll ModalFrame StaticEdge NoIntegralHeight Transparent Font.Size Font.Underline Font.Style Font.Name Font.Strikeout	RightToLeftReadingOrder	SelectString	
Text Box			
AutoSize Border ClientEdge HorizontalScroll LeftScrollBar VerticalScroll Lowercase Uppercase NoHideSelection	AutoHScroll AutoVScroll HelpContextID hWind Number OEMConvert Password Enabled RightToLeftReadingOrder WantsReturn		

Formatting Properties	State Properties	Methods	Events
Font.Underline Font.Style Font.Name Font.Strikeout			
Button, **Radio Button** and **Checkbox**			
AutoSize Flat Multiline PushLike (**Checkbox** specific) UseBitmap UseIcon Font.Size Font.Underline Font.Style Font.Name Font.Strikeout	Auto ButtonStyle Enabled GroupID (**Radio Button** specific)	AboutBox Recalculate	DblClick Error KeyDown KeyPress KeyUp MouseDown MouseMove MouseUp ReadyStateChange
Slider			
AutoTicks ClientEdge StaticEdge NumTicks Transparent	EnableSelectionSelectionLow SelectionHigh	Recalculate	

Other Notable Differences

DOE Functions

- In PTC Mathcad Prime 12.0.0.0, the ordering in the **fullfact**, **fractfact** and **boxwilson** functions is based on *The National Institute of Standards and Technology (NIST)* standard. In previous versions of Mathcad, the ordering is based on *Understanding Industrial Designed Experiments/Book and Disk-Excel [Hardcover]* by Stephen R. Schmidt and Robert G. Launsby.
- In PTC Mathcad Prime 12.0.0.0, the result of **boxwilson** is displayed as a matrix, whereas in previous versions of Mathcad it is displayed as a table. The accuracy of the result is not affected.

Previous Versions of Mathcad

$$\text{fullfact}(2) = \begin{pmatrix} \text{"Run"} & \text{"Block"} & \text{"A"} & \text{"B"} \\ 1 & 1 & -1 & -1 \\ 2 & 1 & -1 & 1 \\ 3 & 1 & 1 & -1 \\ 4 & 1 & 1 & 1 \end{pmatrix}$$

PTC Mathcad Prime 12.0.0.0

$$\text{fullfact}(2) = \begin{bmatrix} \text{“Run”} & \text{“Block”} & \text{“A”} & \text{“B”} \\ 1 & 1 & -1 & -1 \\ 2 & 1 & 1 & -1 \\ 3 & 1 & -1 & 1 \\ 4 & 1 & 1 & 1 \end{bmatrix}$$

Previous Versions of Mathcad

$$\text{fractfact}(3,1) = \begin{pmatrix} \text{"Run"} & \text{"Block"} & \text{"A"} & \text{"B"} & \text{"C=AB"} \\ 1 & 1 & -1 & -1 & 1 \\ 2 & 1 & -1 & 1 & -1 \\ 3 & 1 & 1 & -1 & -1 \\ 4 & 1 & 1 & 1 & 1 \end{pmatrix}$$

PTC Mathcad Prime 12.0.0.0

$$\text{fractfact}(3,1)=\begin{bmatrix} \text{“Run”} & \text{“Block”} & \text{“A”} & \text{“B”} & \text{“C=AB”} \\ 1 & 1 & -1 & -1 & 1 \\ 2 & 1 & 1 & -1 & -1 \\ 3 & 1 & -1 & 1 & -1 \\ 4 & 1 & 1 & 1 & 1 \end{bmatrix}$$

Previous Versions of Mathcad

boxwilson(2) =

	0	1	2	3
0	"Run"	"Block"	"A"	"B"
1	1	1	-1	-1
2	2	1	-1	1
3	3	1	1	-1
4	4	1	1	1
5	5	1	0	0
6	6	1	0	0
7	7	1	0	0
8	8	1	0	0
9	9	1	0	0
10	10	1	1.414	0
11	11	1	-1.414	0
12	12	1	0	1.414
13	13	1	0	-1.414

PTC Mathcad Prime 12.0.0.0

$$\text{boxwilson}(2)=\begin{bmatrix} \text{“Run”} & \text{“Block”} & \text{“A”} & \text{“B”} \\ 1 & 1 & -1 & -1 \\ 2 & 1 & 1 & -1 \\ 3 & 1 & -1 & 1 \\ 4 & 1 & 1 & 1 \\ 5 & 1 & 0 & 0 \\ 6 & 1 & 0 & 0 \\ 7 & 1 & 0 & 0 \\ 8 & 1 & 0 & 0 \\ 9 & 1 & 0 & 0 \\ 10 & 1 & 1.414 & 0 \\ 11 & 1 & -1.414 & 0 \\ & & & \vdots \end{bmatrix}$$

Greek Letters in Text Regions

To insert a Greek letter inside a PTC Mathcad Prime 12.0.0.0 text region, first type the equivalent Latin character, then select the typed letter and change its font to **Symbol**. Alternatively, insert the character from the Character Map program under Accessories.

You can also copy a variable name containing Greek symbols from a math region to a text region.

Apostrophe and First Derivative Operator in Math Regions

To insert an apostrophe inside a PTC Mathcad Prime 12.0.0.0 math region, simply type ‘ (apostrophe). To insert the first derivative (prime operator), type Ctrl+’.

Previous Versions of Mathcad	PTC Mathcad Prime 12.0.0.0
$f(x) := x + 1$ Insert an apostrophe by pressing the ` (back quote).	$f'(x) := x + 1$ Insert an apostrophe by pressing the ‘ (apostrophe).

Images

PTC Mathcad Prime 12.0.0.0 does not have a Picture tool. To display an image that results from processing an input image, save the new image to the current working directory and on the **Math** or **Document** tab, in the **Regions** group, click **Image**. Click **Browse for Image...** to locate and insert your image.

2

Resolving Conversion Issues

When you convert a legacy worksheet to PTC Mathcad Prime 12.0.0.0 format, the converted file may contain visual or calculation issues that require your intervention. Use the information in this chapter to learn how to resolve file conversion issues.

Region Placement

The worksheet conversion process may result in some regions overlapping other regions. This can be caused by one or more of the following reasons:

- Difference in page size
- Difference in font size and style
- Little or no space between regions in the legacy worksheet
- Excel component display differences
- Matrix display differences

Resolution

Click near the top of the page in the PTC Mathcad Prime 12.0.0.0 worksheet. On the **Document** tab, in the **Spacing** group, click **Separate Regions** and then select **Vertically** or **Horizontally**.

Worksheet Calculation

The worksheet conversion process might run into math regions that it cannot resolve or plot regions that it cannot convert. The converter turns such regions into images with appropriate annotations so none of your original content is lost.

Numeral Zero

Converting legacy worksheets that contain expressions with units, such as *0/1s + 2m/1s*, that ran error free might yield an error in PTC Mathcad Prime 12.0.0.0.

This is because to implement dynamic unit checking (*DUC*) in a more flexible manner, PTC Mathcad Prime 12.0.0.0 must assume that the *0* in *0/1s* is unitless and therefore *0/1s* has dimension *1/time* (for example, frequency). Therefore adding frequency *0/1s* to velocity *2m/1s* will correctly result in an error because the units are not compatible.

To resolve this error, replace the unitless *0* with a zero of dimension *m* to indicate that it represents length. Thus, *0m/1s + 2m/1s = 2 m/s* as expected.

Note

To provide more control over how numeral 0 should behave, PTC Mathcad Prime 12.0.0.0 provides two built-in constants:

- *zero* (lowercase) — Represents dimension less 0. For example, *zero + 1m* yields an error whereas *0 + 1m = 1m*

Use variable *zero* to ensure that the quantity is always checked for correct dimension, even when it has a magnitude of 0.

- *Zero* (uppercase) — Represents 0 of any quantity. It assumes whatever unit is required by the computation. For example, *Zero*m + Zero*s = 0*

  Use variable *Zero* to simulate compatibility with legacy Mathcad treatment.

It is recommended that you always specify the desired unit with every magnitude in mixed unit expressions.

Built-In Variables

When your legacy worksheet contains a built-in variable whose value is defined on the **Calculation** tab, in the **Worksheet Settings** group, you must define that variable at the top of your converted worksheet. For example, if the value of *ORIGIN* in your legacy worksheet is 2, you type *ORIGIN:=2* at the top of your converted worksheet.

Result Formatting

Result formatting differences do not affect the accuracy of results, but some results may look different in your converted worksheet because the following options are different in PTC Mathcad Prime 12.0.0.0:

- Results formatting: Fractions and exponents in engineering formats.
- Show unit exponents as a fraction
- Display precision: PTC Mathcad Prime 12.0.0.0 supports display precision of up to 15 decimal places.
- Matrix display style

Note

When you open a worksheet in PTC Mathcad Prime 12.0.0.0, the results are not recalculated automatically. You must press Ctrl+F5 to recalculate the worksheet and view the actual results in PTC Mathcad Prime 12.0.0.0.

Functions

lu, qr, and cholesky Matrix Decomposition Functions

The legacy **lu**, **qr**, and **cholesky** matrix decomposition, or factorization, functions have been replaced with **LU**, **QR**, and **Cholesky**, respectively. The new case sensitive functions offer enhanced capability in terms of performance and stability, full pivoting and complex support, and no limitation of input matrix dimensions.

The following table highlights the differences between the two groups of functions:

Note

Similar names are used for the output matrices of the legacy functions and their new counterparts, but the form or contents of such matrices are not necessarily similar or equal. Apply a legacy function and its counterpart to the same input matrix and observe the differences in the resulting outputs.

	Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
Syntax	**lu(M)**	**LU(M)**
Input matrix	Real or complex square matrix	Real or complex mxn matrix
Return array	Three augmented square matrices —*P*, *L*, and *U*	A vector containing three nested matrices—*P*, *L*, *U*
Equation	$P \cdot M = L \cdot U$	$P \cdot M = L \cdot U$
Syntax	**qr(M)**	**QR(M,[p])**
Input matrix	Real mxn matrix	Real or complex mxn matrix
Return array	Two augmented matrices—Q and R	A vector containing three nested matrices—*P*, *Q*, *R*
Equation	$M = Q \cdot R$	$M \cdot P = Q \cdot R$
Syntax	**cholesky(M)**	**Cholesky(M,[p,[u]])**
Input matrix	Real positive definite square matrix. (assumed to be symmetric)	Real positive definite square matrix Or: Complex Hermitian definite square matrix

	Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
Return array	One square matrix—L	A vector containing two nested matrices—P, L
Equation	$M = L \cdot L^T$	$P^T \cdot M \cdot P = L \cdot L^T$

Plot Labels

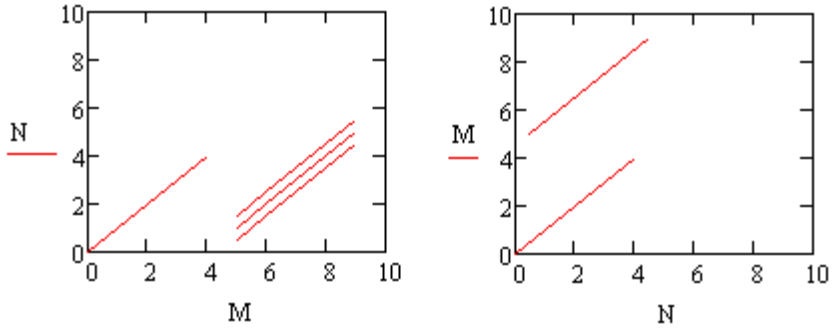
When converting plots with titles from legacy Mathcad versions to PTC Mathcad Prime 12.0.0.0, the formatting of the titles, axis titles, and legend titles is not saved, and they appear in the default formatting. You can change the formatting in PTC Mathcad Prime 12.0.0.0 using the **Text Formatting** tab. The content of the titles is converted and stays unchanged.

2D Plots

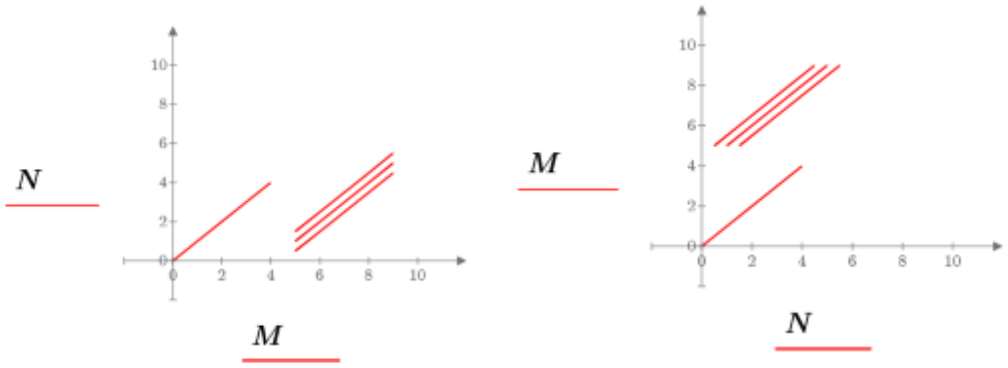
Waterfall Plot

When the y-axis is a matrix of multiple columns, legacy Mathcad plots one trace per column:

$$M := \begin{pmatrix} 0 & 5 \\ 1 & 6 \\ 2 & 7 \\ 3 & 8 \\ 4 & 9 \end{pmatrix} \qquad N := \begin{pmatrix} 0 & 0.5 & 1 & 1.5 \\ 1 & 1.5 & 2 & 2.5 \\ 2 & 2.5 & 3 & 3.5 \\ 3 & 3.5 & 4 & 4.5 \\ 4 & 4.5 & 5 & 5.5 \end{pmatrix}$$



After you convert the worksheet and perform the actions below, PTC Mathcad Prime 12.0.0.0 displays the plot as follows:



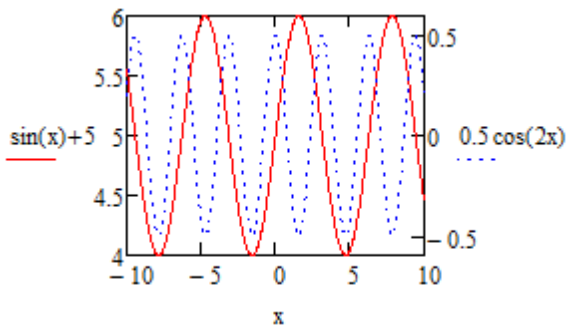
Perform one of the following actions:

- XY plot—When the number of columns of x is greater than y (as in the plot on the right), a trace is plotted for each column in the x axis expression. You must delete the extra columns in x if you want this plot to look exactly as the legacy plot.
- Polar plot—Plot the columns one at a time with one y-axis expression per vector.

Secondary Y Axis

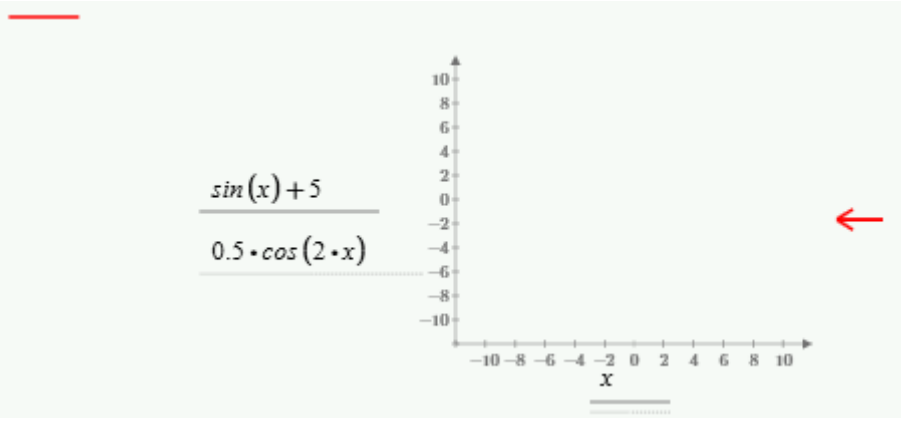
When your legacy plot contains a secondary y-axis, the plot is converted as follows — assuming the tick marks of the first y-axis were user-defined:

Legacy Plot



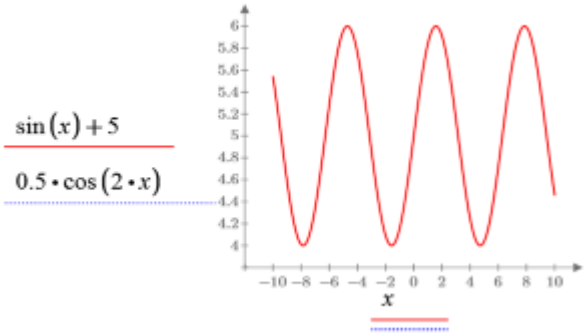
Opening the converted file shows an annotated plot but no traces. The annotation message explains that the secondary y-axis is not supported in the current version of PTC Mathcad Prime 12.0.0.0, and that all traces have been converted to the primary y-axis.

After Conversion



To resolve the issue, do the following:

1. Clear the annotation.



   Only the primary trace is visible. The secondary trace is not visible because the range of the primary axis is *4–6* while the range of the secondary axis is *–0.5–0.5*.

2. Define the maximum and minimum of the two traces:

$$f1(x) := \sin(x) + 5 \qquad f2(x) := 0.5 \cdot \cos(2 \cdot x)$$

$$f1Max := 6 \qquad f2Max := 0.5$$

$$f1Min := 4 \qquad f2Min := -0.5$$

3. Scale the missing trace as follows:

$$y(x) := \left(\frac{f1Max - f1Min}{f2Max - f2Min}\right) \cdot (0.5 \cdot \cos(2\ x)) + \left(f1Min - \left(\frac{f1Max - f1Min}{f2Max - f2Min}\right) \cdot f2Min\right)$$

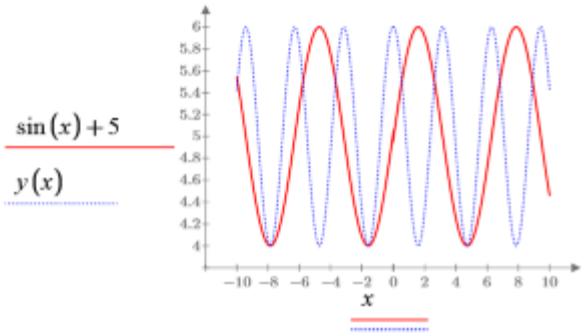
Note

You can use the above scaling formula for plots with a normal scale, but not for plots with a logarithmic scale.

4. Evaluate *y(x)* symbolically to see the symbolic result of the scaling.

$$y(x) \rightarrow 1.0 \cdot \cos(2 \cdot x) + 5.0$$

5. Plot the original function and the newly scaled one.



The two traces now appear as they do in the legacy plot.

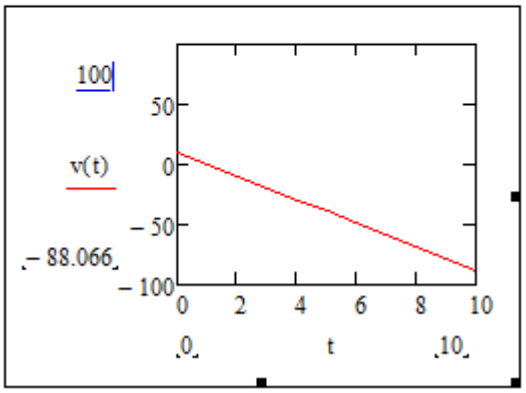
Plots with Units

PTC Mathcad 15.0 does not fully support units in plots. You can place values with units in plotted expressions, limits, and markers, but Mathcad does not perform unit checking. Mathcad uses the magnitude of values converted by default to SI units, or to the unit system you set for the worksheet.

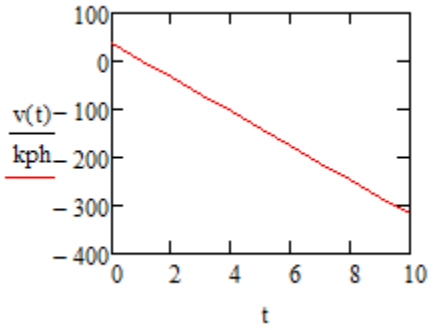
$t := 0s, 1s .. 10s \qquad v_0 := 10\frac{m}{s}$

$v(t) := v_0 - g \cdot t$

$v(2s) = -9.613\frac{m}{s}$

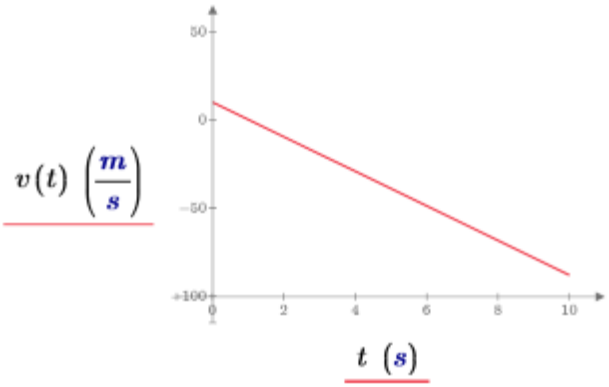


If you wish to scale the y-axis of the PTC Mathcad 15.0 plot and view velocity in terms of kilometer per hour, you must divide the plotted function *v(t)* by *kph*:

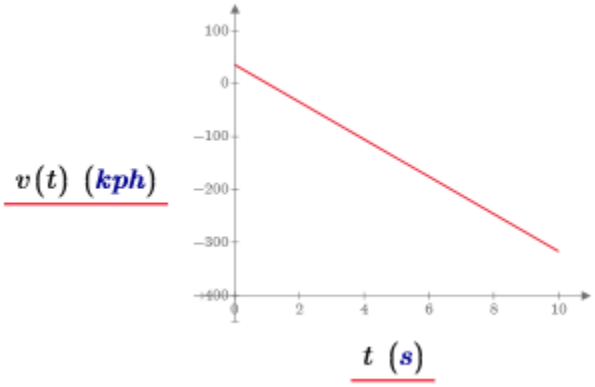


With PTC Mathcad Prime 12.0.0.0, you can plot functions and data with units, and Mathcad scales the axes values appropriately.

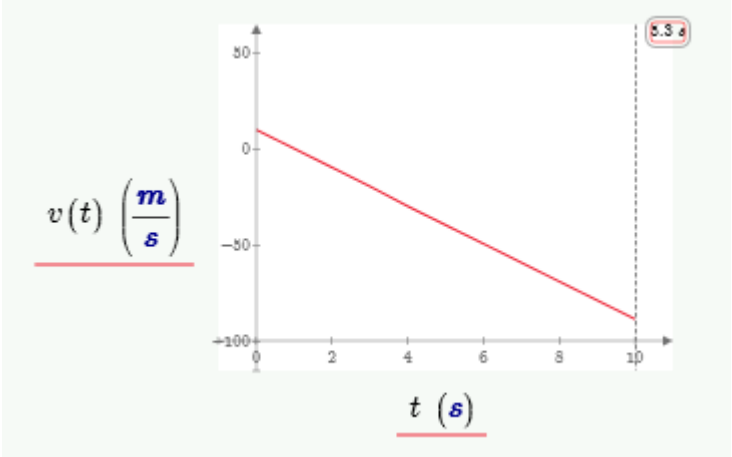
Type the vertical and horizontal expressions *v(t)* and *t* and Mathcad inserts the units into the unit placeholders automatically.

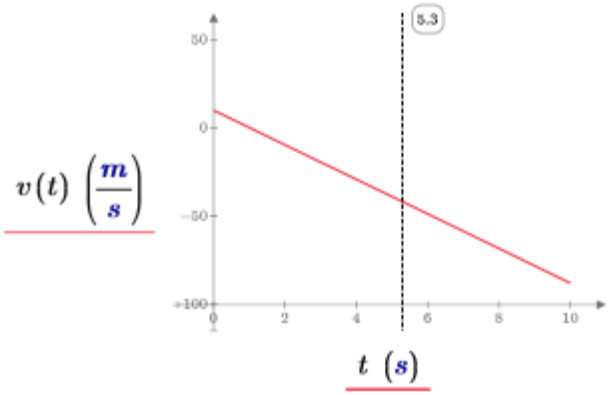


To view velocity in terms of kilometer per hour, select the unit placeholder and type *kph*.



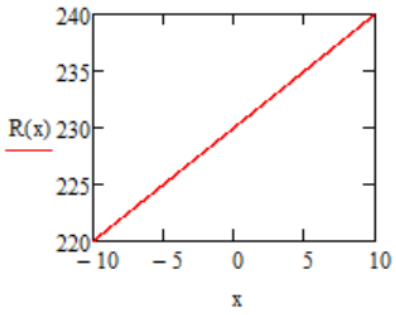
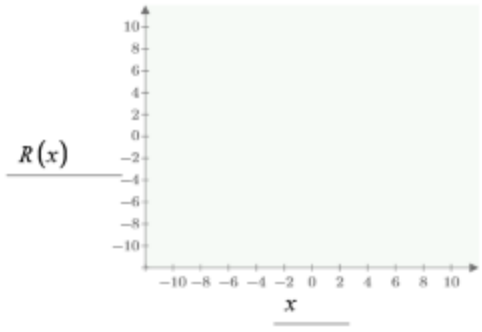
If your legacy plot contains markers or tick marks with units, after conversion you must remove the unit to clear the error.





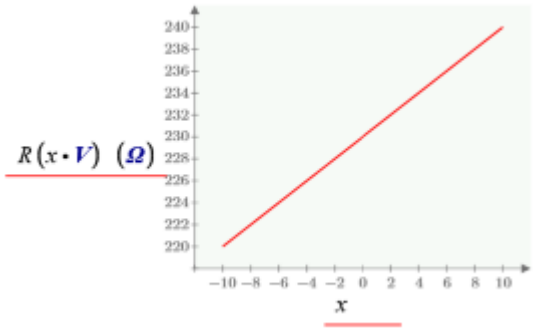
Plotting Functions with Units

When your legacy worksheet contains a plot of a function whose arguments require units, the conversion result is as follows:

Legacy Plot	After Conversion
$R(I) := \frac{I + 230V}{1A}$ 	$R(I) := \frac{I + 230 \cdot V}{1 \cdot A}$ 

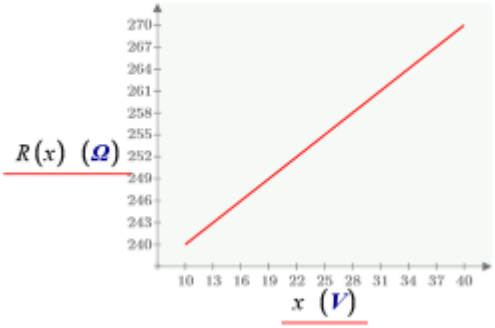
To resolve this issue, follow one of these options:

- Multiply the proper function argument with the required unit.



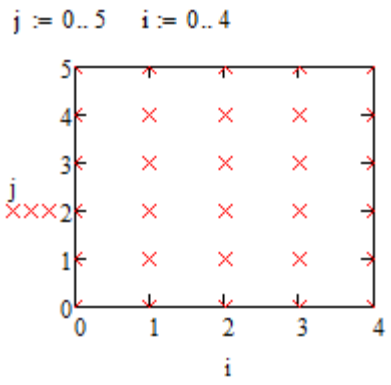
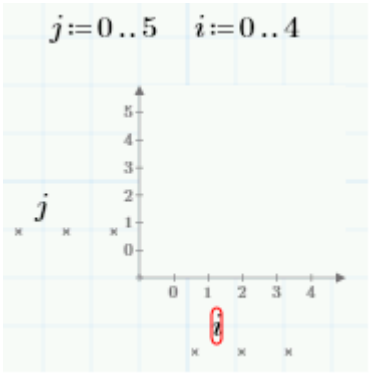
- Add a range variable with units.

$x := 10\ V, 11\ V .. 40\ V$



Plotting Two Range Variables

When your legacy worksheet contains a plot with two range variables, the conversion result is as follows:

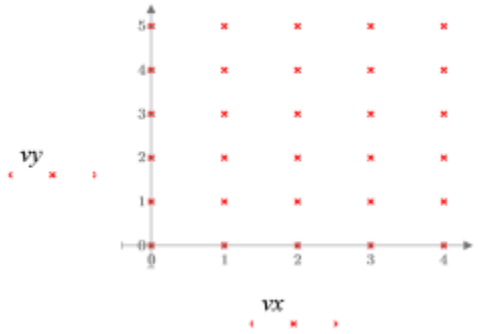
Legacy Plot	After Conversion
	

To resolve the issue, define vectors *vx* and *vy* above the converted plot:

$$vx := \left\| \begin{array}{l} \text{for } j \in 0..5 \\ \quad \left\| \begin{array}{l} \text{for } i \in 0..4 \\ \quad \left\| vx_{j,i} \leftarrow i \right. \end{array} \right. \\ vx \end{array} \right.$$

$$vy := \left\| \begin{array}{l} \text{for } j \in 0..5 \\ \quad \left\| vy_{j} \leftarrow j \right. \\ vy \end{array} \right.$$

Replace *j* and *i* in the plot with *vy* and *vx*.



Note

This solution only applies to XY plots.

3D Plots

In previous versions of Mathcad, you can insert various types of 3D plots in your worksheet. In PTC Mathcad Prime 12.0.0.0, scattered data, curves, and surfaces are converted to a single type of 3D plot.

Mathcad converts the tick mark values according to their settings in the legacy plot. When the plot displays a function, the converter calls **CreateMesh** or **CreateSpace** to capture its original ranges, including its start and end points, as well as its number of intervals.

After you open the converted file in PTC Mathcad Prime 12.0.0.0, you do not need to keep the call to **CreateMesh** or **CreateSpace**. You can obtain an identical looking plot by typing the function name directly in the axis expression and then by editing the tick mark values, by editing the number of grids points, or by defining range variables above the plot.

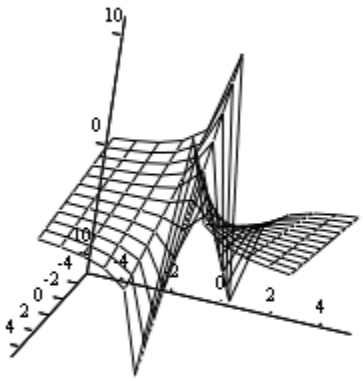
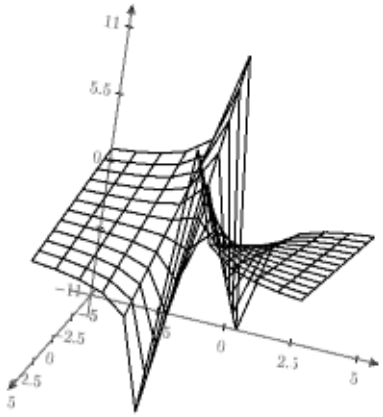
Functions of Two Arguments with Default Starts and Ends

When a legacy plot displays a function of two arguments with default starts (-5) and ends (5), the converter does not need to add arguments to **CreateMesh** or **CreateSpace** to define the lower and upper bounds of the plotted range.

In previous versions of Mathcad, the number of plotted points is defined as the number of grids (or intervals). However, in **CreateMesh**, the number of plotted points is defined as the number of grid points. The converter must add +1 to the number of intervals to preserve the original plotted range.

Note

The default plotted range in PTC Mathcad Prime 12.0.0.0 is (-10, 10). When changing the **Number of Points** on the Ribbon, you are changing the number of grid points and not the number of intervals.

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
A function of 2 arguments with 5 intervals in the x- and y-direction. The intervals are defined in the **Properties** dialog box under the **QuickPlot** tab.	After conversion, the plot displays **CreateMesh** with 12 points in the x- and y-direction.
$f(x,y) := \frac{x}{y}$  f	$f(x,y) := \frac{x}{y}$  CreateMesh $(f, 12)$

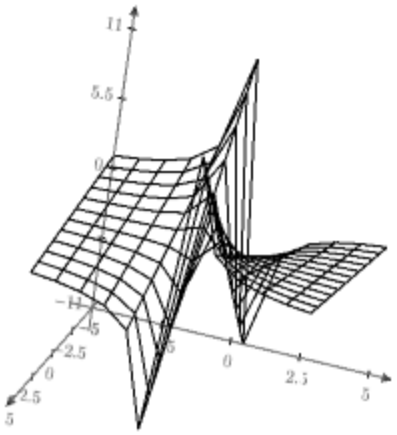
In this example, due to the singularity at (0, 0), the function can only be plotted with an odd number of intervals as seen in previous Mathcad versions, or with even number of points as seen with **CreateMesh** in PTC Mathcad Prime 12.0.0.0.

After conversion, you may want to remove **CreateMesh**. For the example above, you can proceed as follows:

Note

In this particular case, plotting the function returns an error due to the singularity at (0,0). To fix this, replace the division operator with a multiplication operator and go through step 2 before changing back the operator to division.

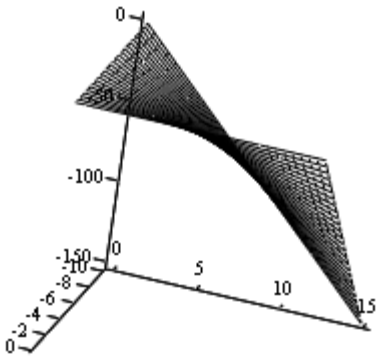
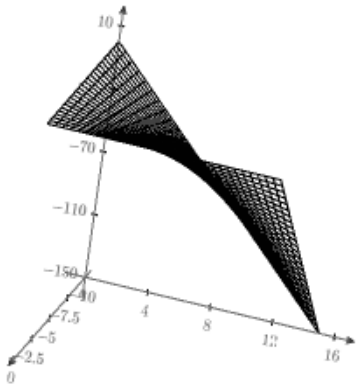
1. In the z-axis expression, replace *CreateMesh(f, 12)* with *f*.
2. On the **Plots** tab, in the **Traces** group, change the **Number of Points** to 12.
3. Edit the minimum and maximum tick mark values of x-axis and y-axis to -5 and 5.



f

Functions of Two Arguments with User-Defined Starts, Ends, and Number of Intervals

When a legacy plot displays a function of two arguments with user-defined starts and ends or number of intervals, the converter adds arguments to **CreateMesh** or **CreateSpace** to define the lower and upper bounds of the plotted range and number of grid points.

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
A function of 2 arguments with 25 intervals in the x-direction and 30 intervals in the y-direction. The plotted range of x is (-10, 0) and the plotted range of y is (0, 15). The intervals are defined in the **Properties** dialog box under the **QuickPlot** tab.	After conversion, the plot displays **CreateMesh** with the corresponding plotted ranged. There are 26 points in the x-direction and 31 points in y-direction.
$f(x,y) := x \cdot y$  f	$f(x,y) := x \cdot y$  $\text{CreateMesh}(f,-10,0,0,15,26,31)$

After conversion, you can replace *CreateMesh(f, s0, s1, t0, t1, sgrid, tgrid)* with *f(x,y)* where *x* and *y* are defined as range variables above the plot:

1. Calculate the step sizes x_s and y_s using the following equations:

$$s0 := -10 \qquad s1 := 0 \qquad sgrid := 26$$

$$t0 := 0 \qquad t1 := 15 \qquad tgrid := 31$$

$$x_s := s0 + \frac{s1 - s0}{sgrid - 1} = -9.6$$

$$y_s := t0 + \frac{t1 - t0}{tgrid - 1} = 0.5$$

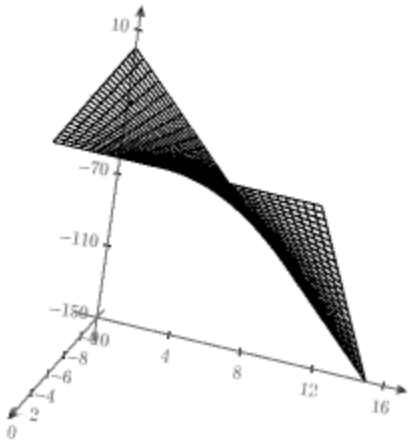
2. Define *x* and *y* as range variables.

$x := s0, x_s .. s1$

$y := t0, y_s .. t1$

3. In the z-axis expression, replace *CreateMesh(f, -10 ,0, 0, 15, 26, 31)* with *f(x,y)*.

$f(x, y) := x \cdot y$

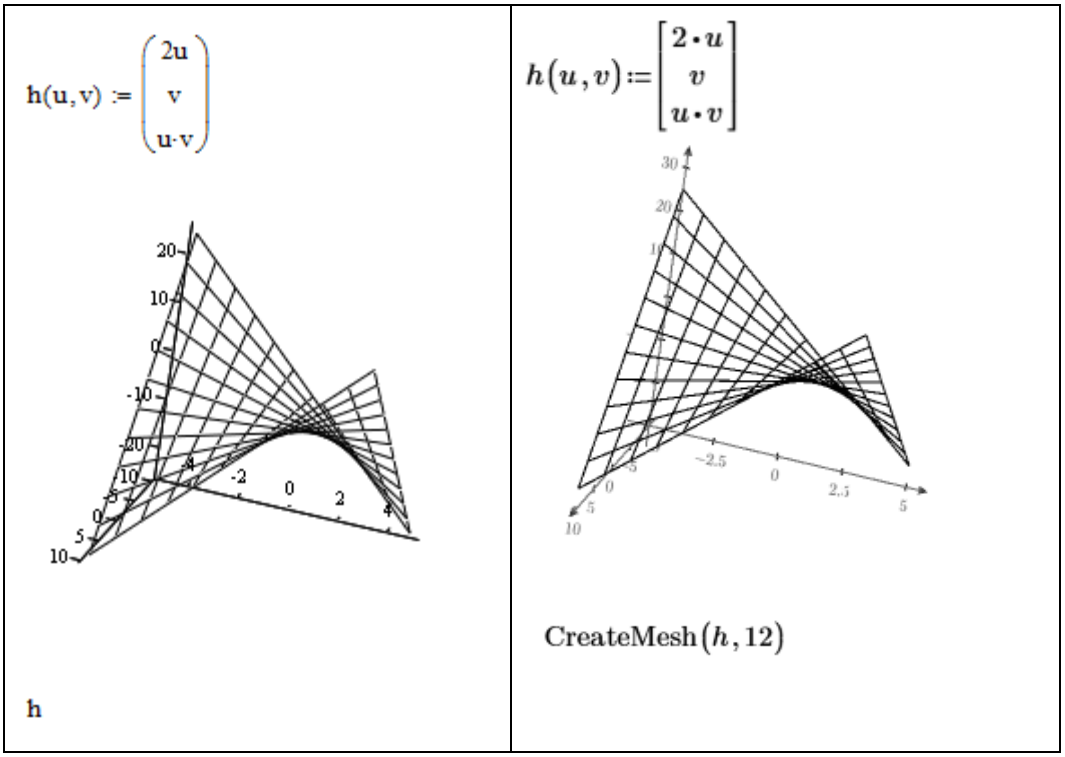


$f(x, y)$

Vector-Valued Functions

Vector-valued functions in legacy plots are converted the same way as functions of two arguments. The plotted range is captured by the arguments of **CreateMesh** or **CreateSpace**.

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
A function defining a parametric surface with 11 intervals. The plotted ranges of x and y are (-5, 5).	Mathcad uses **CreateMesh** to plot the function after conversion, with the corresponding range and grid points.



To remove the call to **CreateMesh**, use the same procedure as described in the previous section where range variables are defined above the plot.

1. Calculate the step size:

$$u0 := -5 \qquad u1 := 5 \qquad grid := 12$$

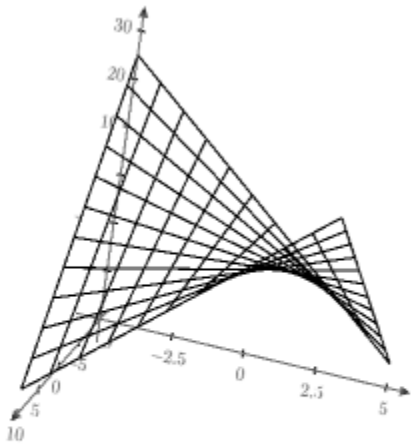
$$u_s := u0 + \frac{u1 - u0}{grid - 1}$$

2. Define the range variables:

$$u := u0, u_s .. u1$$

$$v := u$$

3. Replace *CreateMesh(h,12)* with *h(u,v)*.



$h(u,v)$

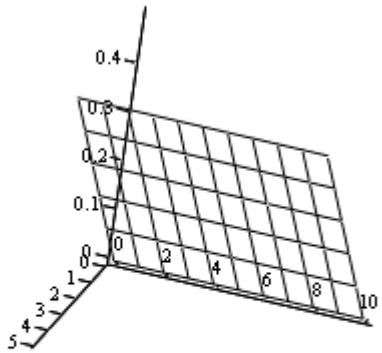
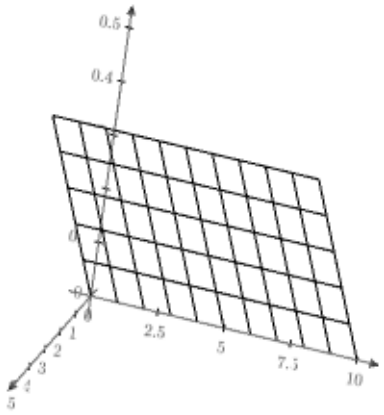
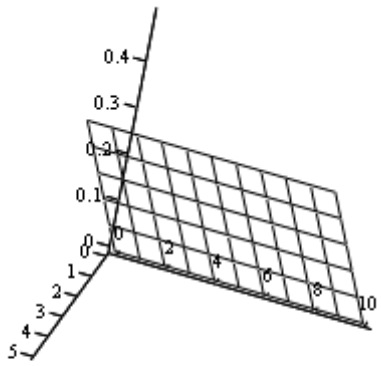
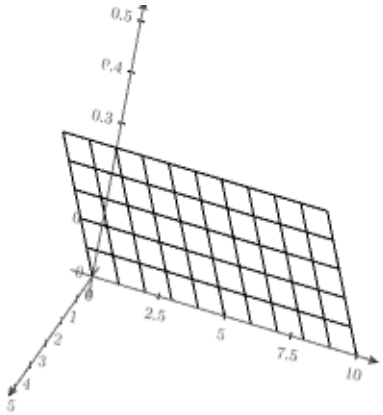
Combined Inputs

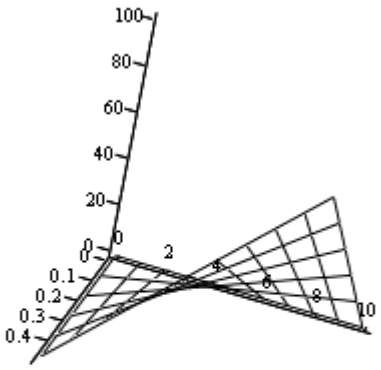
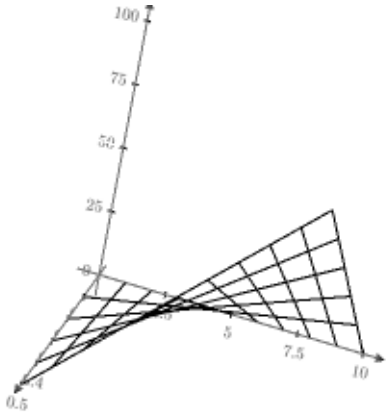
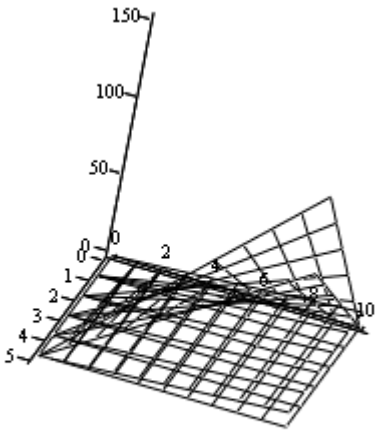
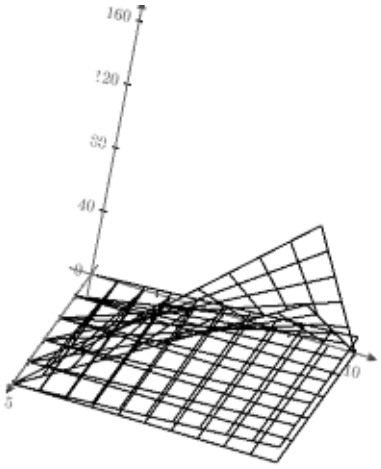
In previous versions of Mathcad, you can combine inputs with parentheses or vectors, instead of defining inputs one by one, separated by commas, as is done in 2D plots. In PTC Mathcad Prime 12.0.0.0, you must define each input in a separate z-axis expression. Mathcad converts combined inputs in such a way as to preserve the look of the converted plot as close as possible to the legacy plot.

For example, given the following combined input, the conversion works as shown below.

$i := 0..5 \qquad j := 0..10$

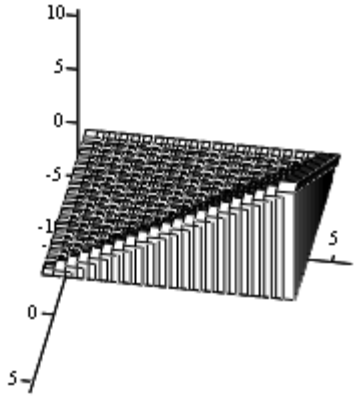
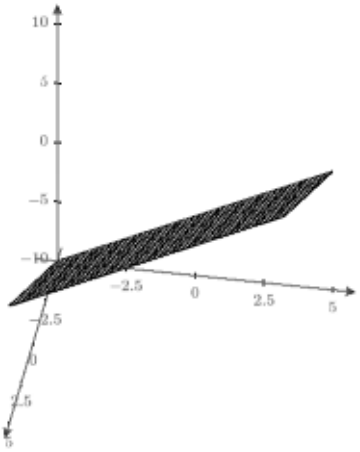
$M_{i,j} := 0.1 \cdot i \qquad N_{i,j} := j \qquad P_{i,j} := 2 \cdot i \cdot j \qquad Q_{i,j} := 3 \cdot i \cdot j$

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
 (M)	 *M*
 (M,N)	 *M*

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
 (M,N,P)	 $\begin{bmatrix} M \\ N \\ P \end{bmatrix}$
 (M,N,P,Q)	 M N P Q

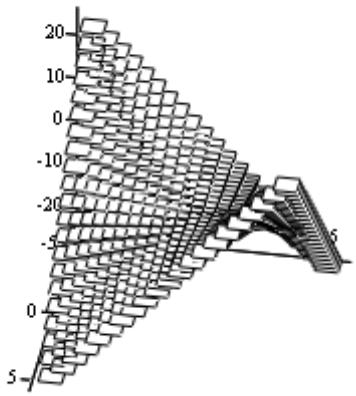
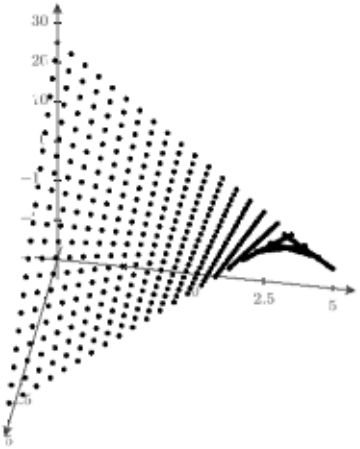
Bar Plots

Bar plots are not supported in PTC Mathcad Prime 12.0.0.0. They are converted to surface plots.

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
$f(x,y) := x + y$  f	$f(x,y) := x + y$  CreateMesh(f, 21)

Patch Plots

Patch plots are not supported in PTC Mathcad Prime 12.0.0.0. They are converted to 3D Scatter plots.

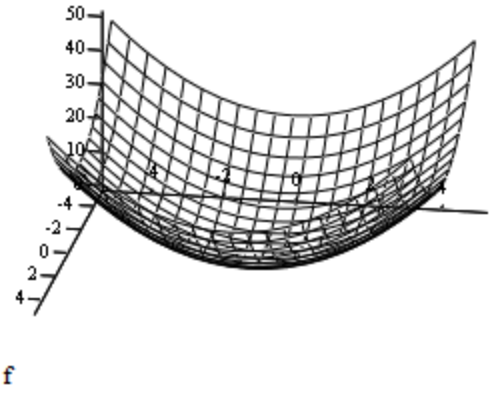
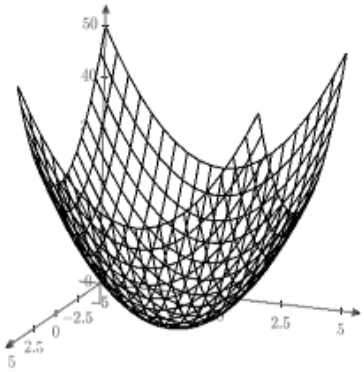
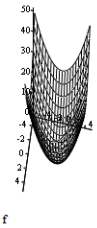
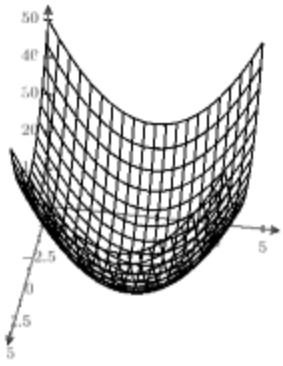
Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
$f(x,y) := x \cdot y$  f	$f(x,y) := x \cdot y$  CreateMesh(f, 21)

Cylindrical and Spherical Coordinate System Plots

In previous versions of Mathcad you can plot data in a cylindrical or a spherical coordinate system. PTC Mathcad Prime 12.0.0.0 converts a cylindrical or a spherical coordinate system plot to an image.

3D Plots Size

When you convert a legacy worksheet that contains a wide or a narrow plot, the converter resets the plot to a cube.

Previous versions of Mathcad	PTC Mathcad Prime 12.0.0.0
	
	

Contour Plots

With contour plots you can view 3D data in a 2D plot. Each contour represents a z value.

The contour function supports a number of input data formats. One such format is a vector of three nested matrices, $[X\ Y\ Z]^T$, representing the x-, y-, and z-coordinates.

The conversion of a legacy contour plot into a PTC Mathcad Prime contour plot fails if the input data format is a vector of three matrices and coordinate matrix *X* or *Y* is not rectangular. In some cases, the conversion succeeds even in the presence of a non-rectangular matrix, but the resulting plot is different than the plot in the legacy worksheet.

For matrix *X* to be rectangular, all values in a single row must be the same, and values in row *R* must be larger than values in row *R-1*:

$$X = \begin{bmatrix} -5 & -5 & -5 & -5 & -5 & -5 & \\ -4.474 & -4.474 & -4.474 & -4.474 & -4.474 & -4.474 & \\ -3.947 & -3.947 & -3.947 & -3.947 & -3.947 & -3.947 & \\ -3.421 & -3.421 & -3.421 & -3.421 & -3.421 & -3.421 & \\ -2.895 & -2.895 & -2.895 & -2.895 & -2.895 & -2.895 & \\ -2.368 & -2.368 & -2.368 & -2.368 & -2.368 & -2.368 & \\ & & & & & & \ddots \end{bmatrix}$$

Similarly, for matrix *Y* to be rectangular, all values in a single column must be the same, and values in column *C* must be larger than values in column *C-1*:

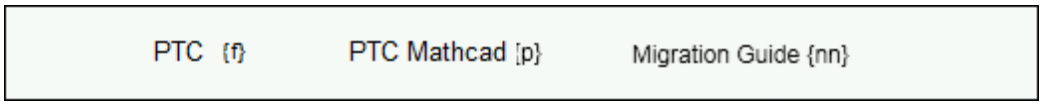
$$Y = \begin{bmatrix} -5 & -4.474 & -3.947 & -3.421 & -2.895 & -2.368 & \\ -5 & -4.474 & -3.947 & -3.421 & -2.895 & -2.368 & \\ -5 & -4.474 & -3.947 & -3.421 & -2.895 & -2.368 & \\ -5 & -4.474 & -3.947 & -3.421 & -2.895 & -2.368 & \\ -5 & -4.474 & -3.947 & -3.421 & -2.895 & -2.368 & \\ -5 & -4.474 & -3.947 & -3.421 & -2.895 & -2.368 & \\ & & & & & & \ddots \end{bmatrix}$$

Headers and Footers

Legacy worksheet header:

PTC {f}	PTC Mathcad {p}	Migration Guide {nn}

Conversion output:



The following table outlines the legacy header and footer syntax and the equivalent command on the PTC Mathcad Prime 12.0.0.0 **Document** tab, in the **Headers and Footers** group. Use the table to replace the legacy syntax character with the equivalent PTC Mathcad Prime 12.0.0.0 header or footer field.

Legacy Syntax	Description	PTC Mathcad Prime 12.0.0.0 Command
{f}	Insert file name	**File ▸ Name**
{p}	Insert file path	**File ▸ Path**
{n}	Insert page number	**Page Number** with choices
{nn}	Insert number of pages	**Page Number** with choices
{fd}	Insert date last saved	**Saved Date**
{ft}	Insert time last saved	Not available
{d}	Insert current date	Not available
{t}	Insert current time	Not available

Note

- You may need to resize images or format text to keep the content within the header or footer.
- If your header is too wide to fit, change the margins to wide margins.

Spell Check

In legacy Mathcad, you can select a spell check language from the **Tools ▸ Preferences ▸ Language** dialog window, where you have a choice of different dictionaries in each of the supported languages. This language is used to check the spelling in all regions of a legacy worksheet, but this language setting is not saved in the worksheet.

In PTC Mathcad Prime 12.0.0.0 or later, you can select a language from the **Text Formatting ▸ Proofing Language** list of installed languages.

Text regions in a legacy worksheet can contain text in one or more languages, but when you open the converted worksheet in PTC Mathcad Prime 12.0.0.0, or later, the default proofing language is English (United States), and spell check automatically checks the spelling in all text regions:

- If the converted worksheet contains English text only, then spell check underlines all misspelled words in all text regions.
- If the converted worksheet contains regions with mixed languages, then spell check underlines all misspelled words in all text regions - including non English words which it obviously cannot find in its English dictionary.

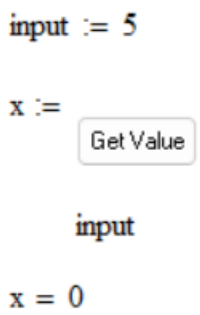
  To fix misspelled non English words:

  1. Highlight the sequence of non English words in one region at a time, and select the matching proofing language.
  2. Click each misspelled word within that sequence and choose the correct spelling from the list of suggested words, if any. You can also ignore the word or add it to the custom dictionary.

Advanced Controls

Scripts that use legacy Mathcad automation interface to get or set values must be updated after conversion. The legacy Mathcad API and the PTC Mathcad Prime 12.0.0.0 API are different.

The scripts in the following section outline the legacy and the equivalent PTC Mathcad Prime 12.0.0.0 script for a button that gets a value of a worksheet variable, and the output is updated only upon clicking the button.



Use the scripts below to replace the legacy scripts with the equivalent PTC Mathcad Prime 12.0.0.0 scripts. The `Worksheet.GetValue` method from the legacy script will not work in PTC Mathcad Prime 12.0.0.0. To fix this you can choose one of the two options below:

1. In PTC Mathcad Prime 12.0.0.0, `Inputs(0).Value` is available in the `Click` event. Replace the `GetValue` method with the

`Inputs(0).Value` call. This scriptable control appears has the following appearance in the script:

Here is the script used in Legacy Mathcad:

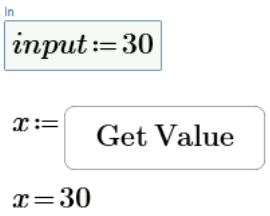
```
Dim state
Dim inputValue

Sub PushBtnEvent_Start()
  Rem TODO: Add your code here
End Sub

Sub PushBtnEvent_Exec(Inputs,Outputs)
Outputs(0).value = inputValue
End Sub

Sub PushBtnEvent_Stop()
  Rem TODO: Add your code here
End Sub

Sub PushBtn_Click()
'The GetValue method is used here because the Inputs(0).value
'is not available in the Click event handler
inputValue = Worksheet.GetValue("input")
If state = 0 Then
state = 1
Else
state = 0
End If
PushBtn.
```

Here is the script used in PTC Mathcad Prime 12.0.0.0:

```
Dim state
Dim inputValue

Sub PushBtnEvent_Start()
  Rem TODO: Add your code here
End Sub

Sub PushBtnEvent_Exec(Inputs,Outputs)

End Sub

Sub PushBtnEvent_Stop()
```

```
  Rem TODO: Add your code here
End Sub

Sub PushBtn_Click()
'Inputs(0).value is  available in the Click event handler
Outputs(0).value= Inputs(0).Value
If state = 0 Then
state = 1
Else
state = 0
End If
End Sub
```

2. Use the PTC Mathcad Prime 12.0.0.0 API access the worksheet variable. Before updating the script make sure that the variable is marked as an input. To do this, select the region, go to the **Input/Output** tab and select **Assign Inputs**.



Legacy scripts that use API calls will not run in PTC Mathcad Prime 12.0.0.0 due to the different API's. Scripts that contain such calls must be updated to use the PTC Mathcad Prime 12.0.0.0 API. Refer to the PTC Mathcad Prime 12.0.0.0. documentation for more information.

A

Supported and Unsupported Features

This appendix provides a comprehensive list of supported and unsupported features for PTC Mathcad Prime 12.0.0.0.

A number of Mathcad functions have been deprecated, and their support will be phased out in future PTC Mathcad Prime releases. Refer to the Help Center for a list of deprecated functions and suggested alternate functions to use in converted or newly created worksheets. Deprecated functions work properly when the worksheets that contain them are converted to PTC Mathcad Prime 12.0.0.0 format. They can also be used in PTC Mathcad Prime 12.0.0.0 directly, but are not documented in the Help Center.

Feature	In PTC Mathcad Prime 12.0.0.0
New Ribbon	
Ribbon user interface based on Microsoft Office	✓
Customizable Quick Access Toolbar	✓
Physical constants in the Ribbon	✓
Features and functionality are more visible and not hidden in menus and dialog boxes	✓
Calculation	
Multithreading	✓
System Support	

Feature	In PTC Mathcad Prime 12.0.0.0
64-bit operating system support	✓
Units	
Dynamic units	✓
Mixed units in matrices and tables	✓
Mixed units in plots	✓
Choice of MKS and None unit systems	✗
Customized unit systems	✓
Most functions now accept units	✓
Functions	
Localized function and keyword names	✗
Two new and more flexible Fourier transform functions	✓
24 new Design of Experiments (DOE) functions that support units	✓
Data Analysis, Signal Processing, and Image Processing Extension Pack functions added	✓
Improved performance for computational signal and image functions	✓
Most functions now accept units	✓
New Read/Write functions: **READCSV** and **WRITECSV**, **READEXCEL** and **WRITEEXCEL**, **READTEXT** and **WRITETEXT**	✓
Advanced KNITRO 7.0 optimization software library for minimize and maximize solvers	✓
New clear variable definitions function for numeric and symbolic expressions	✓
Math and Equation Editor	
Choice of solving algorithms	✓
Custom currency symbols	✗
Definition and evaluation on the same line	✓
Equation break	✓
Error tracing	✓

Feature	In PTC Mathcad Prime 12.0.0.0
Explicit evaluation feature	✓
Hexadecimal, octal, and binary number format	✓
Included worksheets can be cached for portability	✓
Literal subscripts can be inside a variable name like H_2O	✓
Math styles	×
Mixed numbers (fractions)	×
Multilevel worksheet references (include referenced files inside another worksheet)	✓
New improved equation editor showing structure of the math	✓
New Labels feature for using the same names for different elements, such as *m* for meters and *v* for variables.	✓
Pdesolve and PDE solve blocks	✓
Result Formatting Tolerance: Zero and complex threshold	✓
Number format: Show exponents as E±000	×
Solve blocks as a block that can be moved as a grouped regions with a border	✓
Solve blocks contain local variables.	✓
Symbolic math (except for menu symbolics, symbolics in solve blocks, and symbolic result formatting)	✓
Large symbolic results are truncated and can be resized to view as much of the result as desired	✓
Matrices and Vectors	
Add and delete rows and columns from the Ribbon or with the mouse	✓
Insert matrix with desired rows and columns from the Ribbon	✓
Matrix navigator for panning and resizing large matrices	✓
Mixed units in matrices	✓
Operators	

Feature	In PTC Mathcad Prime 12.0.0.0
Custom display of operators	×
Custom operators, prefix and postfix operators	×
Direct substitution of operators by overtyping	✓
Global definition	✓
Gradient operator	✓
Indefinite integral	✓
New linear and circular convolution operators	✓
New polar operator	✓
New row operator for matrices	✓
Picture operator	×
Scalar operator	✓
Square root and nth root operator combined into one operator	✓
Two derivative operators combined into one operator with multiple placeholders	✓
Two product operators combined into one operator with multiple placeholders	✓
Two summation operators combined into one operator with multiple placeholders	✓
Two-sided, left-hand, and right-hand limit operator combined into one operator	✓
New Is Element Of comparison operator	✓
Plots	
2D plots; traces: line, column, bar, stem, waterfall, error, box, effects	✓
Animation, vector field plot, 3D bar, 3D patch, second y-axis	×
Box plot	✓
Contour plots (improved)	✓
Effects plot	✓

Feature	In PTC Mathcad Prime 12.0.0.0
Hide axis expression	✓
Line markers (unlimited number)	✓
Mixed units in plots	✓
Pareto plot	✓
Polar plots	✓
Plot titles and legends	✓
3D plots: spin, pan, zoom	✓
3D plots: surfaces, curves, scattered plots	✓
2D plots: trace and zoom	×
Waterfall plots and plotting matrices	✓
Chart Component: A region for better visualization and presentation of your XY data using the customization options found in the new chart user interface.	✓
Programming	
Debugging tools	×
Easier editing of programs	✓
Mathsoft controls and web controls	✓
New programming operators: if/else-if/else and if/also-if/else	✓
Programming operators can be inserted by typing	✓
Document Features	
Align regions horizontally and vertically	×
Auto save	×
Collapsed areas	✓
Copy worksheet regions to clipboard	✓
Copy worksheet regions to WORD	✓
Compare worksheets	×
Draft view and page view display	✓
E-books	×

Feature	In PTC Mathcad Prime 12.0.0.0
Embedded math in text	✓
Find and Replace	✓
Find all and replace all	×
Grid with two display settings	✓
Hyperlinks	✓
Improved headers and footers	✓
Insertion of OLE objects	✓
Landscape pages	✓
Locked areas	✓
Math and text formatting	✓
Multiple tabbed worksheet interface	✓
Paste special	×
Print to XPS and PDF	✓
Math and text region background color	✓
Region border	✓
Ruler and guidelines	×
Save to RTF	✓
Separate regions vertically or horizontally	✓
Spell check	✓
Tab to different regions	✓
Templates	✓
Text blocks that push down other regions	✓
Text styles	✓
Tile worksheets	×
View regions	×
Wide pages in draft view	✓
Worksheet protection	×
XMCD, MCD Converter (single or batch) for converting	✓

Feature	In PTC Mathcad Prime 12.0.0.0
previous versions of Mathcad worksheets to PTC Mathcad Prime 12.0.0.0 with annotated differences	
Documentation	
New Help with bookmarks and math that can be copied to PTC Mathcad Prime 12.0.0.0 worksheets	✓
New tutorials	✓
Migration Guide for converting older worksheets to PTC Mathcad Prime 12.0.0.0	✓
Detailed tooltips	✓
Tables	
Insert a table with desired rows and columns from the Ribbon	✓
Add and delete rows and columns by using the Ribbon or keyboard shortcuts	✓
Tables include a header row for listing units	✓
Each column can contain values of different units	✓
Define multiple variables with vectors and units	✓
Integration with other applications	
Microsoft Excel 2003, 2007, 2010 support	✓
Excel add-in	✖
Import or paste from Excel	✓
READEXCEL function with preview and ability to edit function for parametric processing	✓
PTC Mathcad Prime 12.0.0.0 integration	✓
Windchill Workgroup Manager integration	✓
Excel Component	✓
Automation API	✓
SDK (Software Development Kit)	Supported, but available separately.
User-defined DLLs	✓
User-defined scripts	✖