

# Mathcad Prime 4.0 Essentials

## Overview

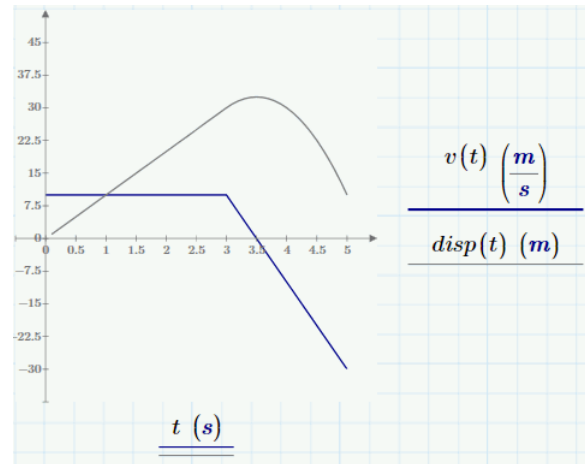
Course Code **TRN-5140-T**

Course Length **16 Hours**

In this course, you will learn the basics of Mathcad Prime. You will learn about Mathcad Prime's extensive functionality, such as opening and working with Mathcad files, navigating workspaces, defining variables and expressions, and solving equations. In addition, you will learn how to plot graphs, solve for roots, and manipulate data.

At the end of each module, you will complete a set of review questions to reinforce critical topics from that module. At the end of the course, you will complete a course assessment in PTC University Proficiency intended to evaluate your understanding of the course as a whole.

This course has been developed using Mathcad Prime 4.0 F000.



## Course Objectives

- Open and save Mathcad files
- Navigate the Mathcad workspace
- Develop Mathcad templates
- Identify and format math and text regions
- Develop and edit math expressions
- Define, evaluate, and use variables
- Assign an expression retroactively
- Define and evaluate user-defined and built-in functions
- Define, evaluate, and use range variables
- Use units in calculations
- Plot 2-D and 3-D graphs
- Solve for the roots of a function with a single independent variable
- Symbolically solve equations
- Numerically solve a system of linear and nonlinear equations
- Solve unconstrained and constrained optimization problems

$$v(t) := 10 \cdot \frac{m}{s} + \left( -20 \cdot \frac{m}{s^2} \right) \cdot (t - 3 \cdot s) \cdot (t > 3 \cdot s)$$

- Solve ordinary differential equations
- Create a program within the Mathcad worksheet using Mathcad's programming features
- Import and export data
- Smooth, interpolate, and regress data

## Prerequisites

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- None

## Audience

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- This class is intended for novice and intermediate Mathcad users. People in related roles will also benefit from taking this course.
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## Agenda

### Day 1

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Module	1	Getting Started
Module	2	Documenting and Formatting
Module	3	Entering and Editing Math
Module	4	Variables
Module	5	Functions
Module	6	Range Variables
Module	7	Controlling Calculations
Module	8	Vectors and Matrices
Module	9	Units
Module	10	2-D Plotting
Module	11	Project – Day 1

### Day 2

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Module	12	3-D Plotting
Module	13	Boolean Conditions
Module	14	Symbolics
Module	15	Solving
Module	16	Optimization
Module	17	Differential Equations
Module	18	Programming
Module	19	Data Exchange
Module	20	Data Analysis
Module	21	Project – Day 2

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## Course Content

### Module 1. Getting Started

- i. Opening Mathcad
- ii. The Mathcad Workspace
- iii. Mathcad Worksheets
- iv. Saving Mathcad Files

*Knowledge Check Questions*

### Module 2. Documenting and Formatting

- i. Text Regions
- ii. Embedding Math in a Text Region
- iii. Options for Formatting Worksheets
- iv. Understanding Mathcad Templates

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### Module 3. Entering and Editing Math

- i. Using Operators
- ii. Entering and Evaluating a Mathematical Expression
- iii. Formatting Math Regions
- iv. Formatting Mathematical Results
- v. Implied Multiplication

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### Module 4. Variables

- i. Defining a Variable
- ii. Numerically Evaluating a Variable
- iii. Defining a Global Variable
- iv. Assigning an Expression Retroactively
- v. Using Literal Subscripts

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### Module 5. Functions

- i. Defining a User-Defined Function
- ii. Inserting a Built-In Function
- iii. Design of Experiments Functions
- iv. Using Deprecated Functions

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### Module 6. Range Variables

- i. Defining a Range Variable
- ii. Using a Range Variable

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### Module 7. Controlling Calculations

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- i. Controlling Calculations
- ii. Using Calculation Options
- iii. Using Areas

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#### **Module 8. Vectors and Matrices**

- i. Vectors and Matrices
- ii. Defining Vectors and Matrices
- iii. Extracting Elements from an Array
- iv. Nested Arrays
- v. Using Array Operators and Functions

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#### **Module 9. Units**

- i. Selecting a Unit System
- ii. Using Units
- iii. Adding Units to Arrays and Range Variables
- iv. Using Angular Units
- v. Using Temperature Units

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#### **Module 10. 2-D Plotting**

- i. Plotting Data in 2-D
- ii. Plotting Functions in 2-D
- iii. 2-D Plot Formatting
- iv. 2-D Trace Formatting
- v. 2-D Axes Formatting
- vi. Using Units with 2-D Plots

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#### **Module 11. Project – Day 1**

- i. Structural Engineering Project – Day 1
- ii. Mechanical Engineering Project – Day 1

#### **Module 12. 3-D Plotting**

- i. Plotting Functions in 3-D
- ii. Formatting a 3-D Plot
- iii. Plotting Data in 3-D
- iv. Plotting Multiple Traces

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#### **Module 13. Boolean Conditions**

- i. Using Boolean Operators
  - ii. Writing Equations Using Boolean Operators
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- iii. Creating Conditional Statements
- iv. Using Piecewise Continuous Functions

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#### **Module 14. Symbolics**

- i. Symbolics
- ii. Symbolic Calculation
- iii. Symbolic Algebra

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#### **Module 15. Solving**

- i. Solving for Roots of Equations
- ii. Numerically Solving Systems of Linear Equations
- iii. Numerically Solving Systems of Nonlinear Equations
- iv. Symbolically Solving Systems of Equations
- v. Modifying the Convergence and Constraint Tolerance

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#### **Module 16. Optimization**

- i. Constrained Optimization
- ii. Unconstrained Optimization

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#### **Module 17. Differential Equations**

- i. Ordinary Differential Equations

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#### **Module 18. Programming**

- i. Creating a Program
- ii. Conditional Statements
- iii. Looping Constructs

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#### **Module 19. Data Exchange**

- i. Importing Data
- ii. Exporting Data
- iii. Using the Excel Component

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#### **Module 20. Data Analysis**

- i. Data Analysis
- ii. Smoothing Data
- iii. Interpolating Data
- iv. Regressing Data

*Knowledge Check Questions*

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**Module 21. Project – Day 2**

- i. Structural Engineering Project – Day 2
  - ii. Mechanical Engineering Project – Day 2
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