

Top Level Mathematics Software for Math Classes



M@th Desktop (MD) is a modern, interactive **teaching and learning software** for mathematics. In order to run M@th Desktop you need *Mathematica* 4.0 - 8.0. MD is designed for teachers and students of:

- * High Schools
- * Technical Schools, Commercial Schools
- * Colleges and Universities (Undergraduates)
- * Universities of Applied Science

MD comprises **tools for teachers** to create tests, tables, data fitting problems, palettes, notebooks and even movies. An exercise pool with additional problems is provided. MD also contains a large help section. Below you see a MD Notebook with two palettes:

The current version of MD consists of the 6 modules **MD**, **MD Functions**, **MD Differentiation**, **MD Integration**, **MD Linear Algebra** and **MD Statistics**. Each module is made up of many palettes and accompanying notebooks. The modules assist the teacher in the class but do not replace him. All modules work fine with **every math textbook** in math classes.

In an **EU math project** 2008-2010, entitled “PC Based Math Projects for High School Students”, MD was chosen once more as the learning software. 14 schools from 11 countries participate in this project. The aims of the project are:

- * Using MD to assist conventional teaching methods using the blackboard
- * Supporting students to reach their relevant key stages according to their level of education
- * Fostering the acceptance of mathematics by using real life examples, which can be solved easily with the help of the computer

Top Level Mathematics Software for Math Classes



Palette

Plot

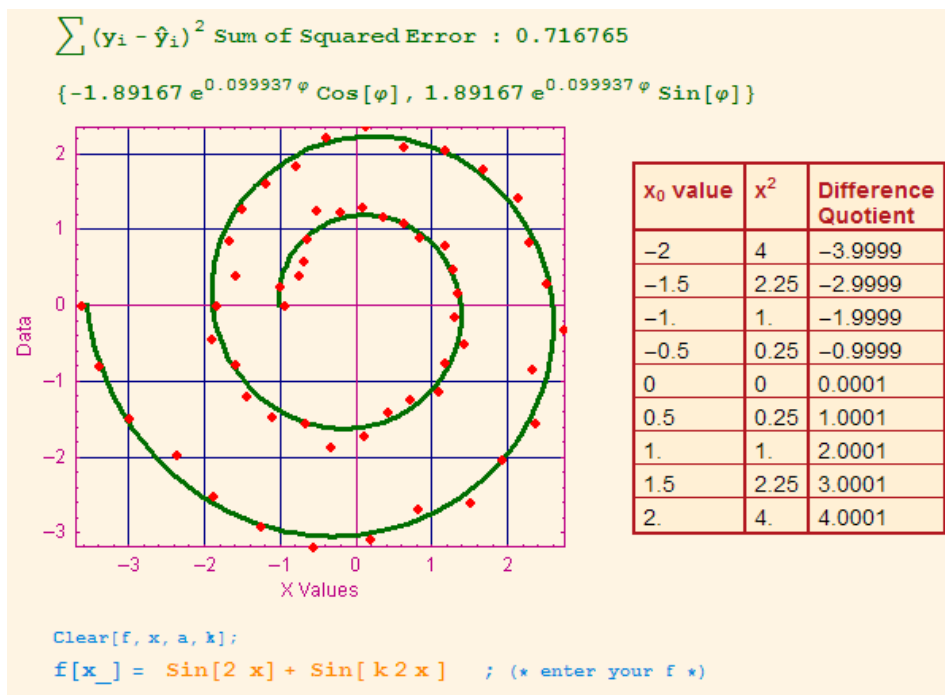
Plot Commands
Plot Show ?
ListPlot

Options

MDNoAsympt
MDPlotLegend
PlotRange
PlotStyle
AxesLabel
PlotLabel
AspectRatio
Frame
GridLines
Epilog
Undo ?

Only Epilog
Color
Text
PointSize
Point
Thickness
Line
?

Close



Palette

Algebra

Term
Expand
Factor
Together
Apart
Full Simplify
Power Expand
Undo ?

Solve Equ
Solve
NSolve
Start Val
FindRoot
Select Sol

Close ?

The module **MD** contains practical palettes and tools for teachers and students. The **Student helper palette** is ideal for students in the class. It offers access to the following palettes just with a click:

The **Plot palette** allows you to draw functions with various options. With the **Algebra palette** you can transform expressions and solve equations. The **Table palette** provides tools to create and read tables.

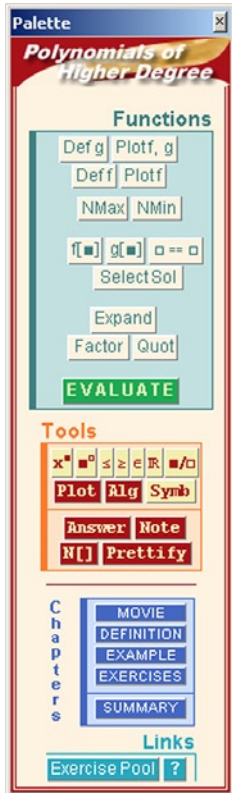
With **MD** you can **plot data** and **fit data** with built-in models and your own models. **MD** provides a gallery of animations, so called **movies**, and tools to create your own ones.

M@th Desktop is **highly customizable** for teachers and students. In M@th Desktop the fully developed programming language of *Mathematica* is available! Therefore you create as many **functions**, **palettes**, **note-books** and **packages** as you like for all MD modules.

The menu of **MD** offers **10 tutorials** for *Mathematica* and M@th Desktop like working with MD helper palettes, introduction to *Mathematica*, programming in *Mathematica* and graphics programming.

The teacher tools of **MD** let you compose **tests**, **practice sheets** and **exercise pools** for students. The problems and the solutions are saved separately.

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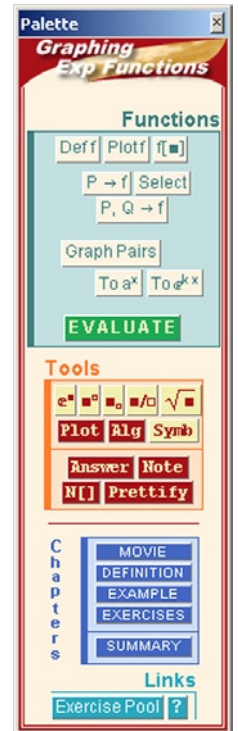
3 EXAMPLE : Step by Step

3.1 How Do Exponential Functions a^x Look Like?
Exp function Given by P and Q

a^x - Examples

Graph the functions for $x \in \{-7, 7\}$. One unit on the y-axis and x-axis equals 1 cm.

(a) $f(x) = 3^x$.
Is f increasing or decreasing?
How high above the x-axis is $f[-5]$ in mm, $f[5]$ in m?



The MD Func module provides tools and examples to assist in learning elementary functions. It consists of **29 MD palettes**, each with an accompanying notebook and additional exercises.

Polynomial and rational functions:

- * Graphing Linear Functions
- * Two Linear Functions
- * Linear Functions in Physics and Economy
- * Quadratic Functions
- * Polynomial Functions
- * Rational Functions
- * Fitting Polynomial and Rational Models to Data
- * Creating Random Numbers

Trigonometric functions:

- * Right Triangle
- * Sin Cos Tan
- * Sine and Cosine Rules
- * Polar Coordinates
- * Trig Equations, Expressions
- * Fitting Sin Cos Tan Models to Data
- * Creating Random Numbers

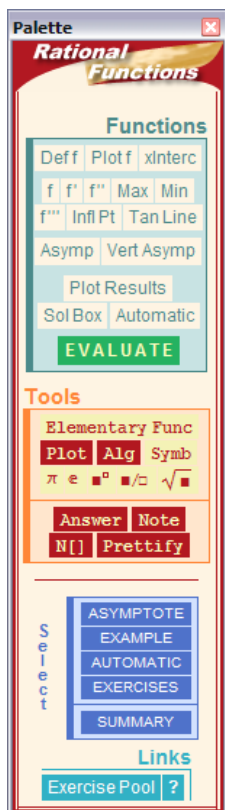
Exponential and logarithmic functions:

- * Graphing Exponential Functions
- * e, Compound Interest
- * e, Compound Interest - UK
- * Growth, Decay Log Functions
- * Log Functions
- * Logistic Models
- * Recursive Models
- * Exp, Log Equations, Expressions
- * Fitting Exp Log Models to Data
- * Creating Random Numbers

Conic sections:

- * Ellipse
- * Hyperbola
- * Parabola
- * Complex Numbers

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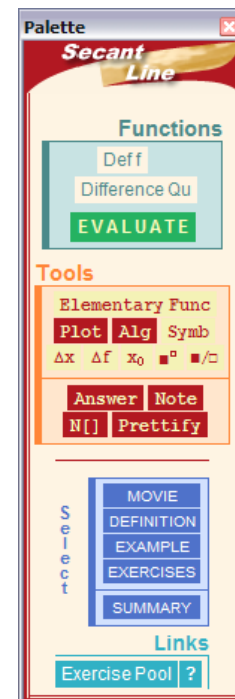


3 EXAMPLE : Step by Step

3.1 Step by Step

Temperature at the Beach Example: A wonderful brochure for Miami Beach states that the temperature of the sea during the springtime rises constantly. Verify this statement for March and May.

Choose $h = 1$ month.
The function $f(x) = 22.1 + 1.069x^2 - 0.178x^3 + 0.00742x^4$ models the rising of the temperature.



The basic and advanced material work fine together with **any math textbook**.

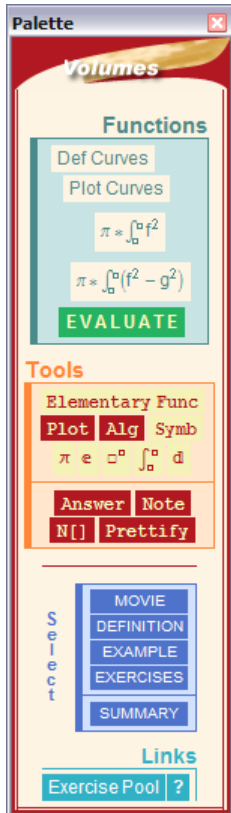
Basic material: The basic material provides tools and examples to assist in learning the basics of differentiation. It consists of **7 MD palettes**, each with an accompanying notebook and additional exercises.

- * Average Velocity
- * Secant Line
- * Differential Quotient
- * Limits
- * Basics Diff Rules
- * Product, Quotient, and Chain Rules
- * Derivatives

Advanced material: This section involves learning the various applications of the derivative. Advanced material consists of **10 MD palettes**, each with an accompanying notebook and additional exercises.

- * Max Min Infl Point
- * Curve Sketching Rational Functions
- * Curve Sketching General Functions
- * Optimization 2D
- * Optimization 3D
- * Implicit Differentiation
- * Partial Derivatives
- * Parametric Curves
- * Polar Curves
- * Curvature

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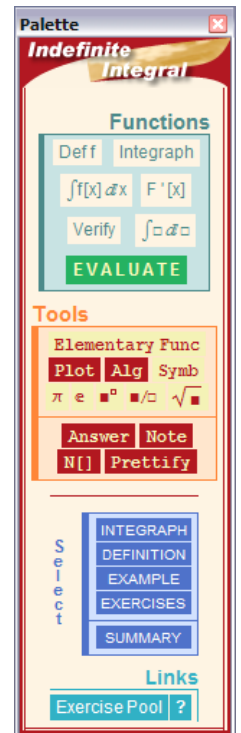
2.2 Calculation of the Volume of Revolution

[Open / Close](#)

A solid of revolution is generated by revolving a plane region about an axis.

Revolution about the x-axis

Let $y = f(x)$ be a continuous function on the interval $[a, b]$. In this example, the function is $\sin(x)$ for $x \in (0, \pi)$.



The basic and advanced material work fine together with **any math textbook**.

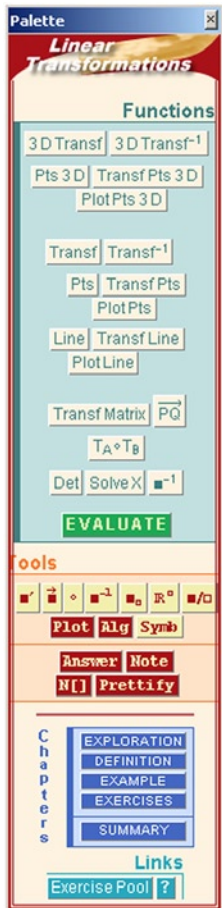
Basic material: Basic material provides tools and examples to assist in learning the basics of integration. It consists of **4 MD palettes, each with an accompanying notebook and additional exercises**.

- * Indefinite Integral
- * Integration Techniques
- * Riemann Sums
- * Definite Integral

Advanced material: This section involves learning the various applications of the integral. Advanced material consists of **10 MD palettes, each with an accompanying notebook and additional exercises**.

- * Area Between Curves
- * Arc Length
- * Volumes
- * Surfaces
- * Center of Mass
- * Work
- * Laplace Transformation
- * Fourier Transformation
- * Diff Equation First Order
- * Diff Equation Second Order

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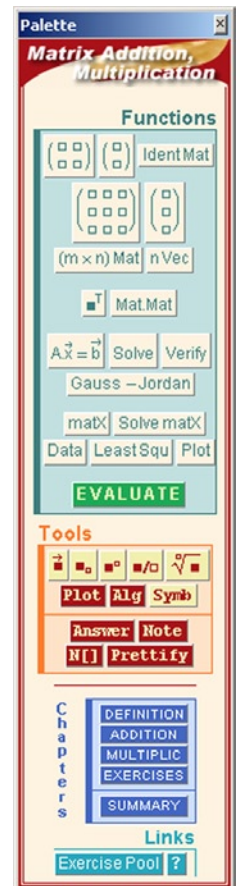
1 EXPLORATION of Transformations

Clear[points, T1, T2, T3, x, y];
 points = {{0, 0}, {0, 1}, {1, 0}};
 $T1[\{x, y\}] = \begin{pmatrix} 0.5 & 0 \\ 0 & 0.5 \end{pmatrix} \cdot \begin{pmatrix} x \\ y \end{pmatrix};$
 Input \triangleright $T2[\{x, y\}] = \begin{pmatrix} 0.5 & 0 \\ 0 & 0.5 \end{pmatrix} \cdot \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 0 \\ 0.5 \end{pmatrix};$
 $T3[\{x, y\}] = \begin{pmatrix} 0.5 & 0 \\ 0 & 0.5 \end{pmatrix} \cdot \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 0.5 \\ 0 \end{pmatrix};$
 MD[SierpinskiGasket[T1[{x, y}], T2[{x, y}], T3[{x, y}], {x, y}, points, MDMovieFrames \rightarrow {6, {1, 6}}]

2. Iteration

3. Iteration

Start \triangleright Stop \blacksquare Delete \times Print



The basic and advanced material work fine together with **any math textbook**.

Basic material: Basic material provides tools and examples to assist in learning the basics of linear algebra. It consists of **10 MD palettes**, each with an accompanying notebook and additional exercises.

- * Linear Equations
- * Vectors
- * Matrix Addition, Multiplication
- * Inverse Matrix, Determinant
- * Linear Independence, Basis
- * Scalar Product
- * Cross Product
- * 2D Lines
- * 2D Distance Point, Line
- * 3D Distance Point, Line, Plane

Advanced material: This section involves learning of more complex linear algebra applications. Advanced material consists of **4 MD palettes**, each with an accompanying notebook and additional exercises.

- * Linear Transformations
- * Eigenvalues, Eigenvectors
- * Conic Sections
- * Rotations, Reflections and More

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Palette
Normal Distribution Basics

Functions

$\phi[z]$ ϕ^{-1} μ, σ z, X

$2\phi[z]-1$ $1-\phi[z]$

$\phi[z_2]-\phi[z_1]$

$P(\mu-\epsilon \leq X \leq \mu+\epsilon)$

$P(X \leq x)$ $P(x \leq X)$

$P(x_1 \leq X \leq x_2)$

Deviation $\mu+z\sigma$

MDS ϕ Plot Deviation

EVALUATE

Tools

μ σ \leq \geq ϕ ∞ \pm

Plot Alg Symb

$\sqrt{P(a \leq X \leq b)}$

Answer Note
N[] Prettify

Select

MOVIE
DEFINITION
EXAMPLE
EXERCISES
SUMMARY

Links
Exercise Pool ?

Reverse Trout Examples 3 year old trouts in a basin have the length of $\mu = 45.2$ cm and $\sigma = 3$ cm.

(a) 33 % of small trouts in the basin must be put in a special basin with more food and oxygen in water.
What is the max length x of a small trout? $P(X \leq x) = 0.33, x = ?$

```
probability = 0.33 ;
Clear[z];
z = z /. FindRoot[MDS $\phi$ [z] == probability, {z, 0}];
Input >
```

MDSNormalDistribution $\mu\sigma$ [$Z \leq z$, {0, 1}]
(* P (Z ≤ ?) = probab *)

$P(Z \leq -0.439913) = 0.33$

Normal Distribution

$z (-\infty)$	$z (-0.439913)$	$P(Z \leq -0.439913)$
$-\infty$	-0.439913	0.33
Dev ($z \sigma$)		
$0. - 0.439913$		

Palette
Chi Square Goodness of Fit

Functions

Data Import
Categorize

\bar{x}, s XRead Table

p for H_0

Observed Counts
Histogram

χ^2 Test χ^2 Table

Test Normal Distrib

EVALUATE

Tools

χ^2 α μ σ H_0 p_0

Plot Alg Symb

Answer Note
N[] Prettify

Select

MOVIE
DEFINITION
EXAMPLE
EXERCISES
SUMMARY

Links
Exercise Pool ?

The basic and advanced material work fine together with **any math textbook**.

Basic material: Basic material provides tools and examples to assist in learning the basics of statistics. It consists of **5 MD palettes**, each with an accompanying notebook and additional exercises and **6 MD notebooks** for Random Number Creation and Simulation Programs.

- * Binomial Distribution Basics
- * Poisson Distribution Basics
- * Normal Distribution Basics
- * Linear Regression
- * Linear Correlation

Advanced material: This section involves learning of more complex statistic applications. Advanced material consists of **6 MD palettes**, each with an accompanying notebook and additional exercises and **4 MD notebooks** for Random Number Creation and Simulation Programs.

- * Normal Distribution - Confidence Interval
- * Normal Distribution - Test of Hypothesis
- * Normal Distribution - Assessing Normality of Data
- * Student t Distribution - Confidence Interval
- * Student t Distribution - Test of Hypothesis
- * Chi Square Distribution -Goodness-of-Fit Test

Top Level Mathematics Software for Math Classes **Price List**

M@th Desktop 8.0 requires *Mathematica*® for Windows and Macintosh 4.0 - 8.0. M@th Desktop prices do not include *Mathematica*®. If you buy a single license of MD, the \$MachineID and \$LicenseID of *Mathematica*® are required.

M@th Desktop 8.0 Educational Software (*Mathematica* 4.0 - 8.0; Windows, Macintosh; English, German)

All prices include VAT.

<i>MD</i> single license, student version, unlimited	EURO	55,—
<i>MD</i> single license, instructor version, unlimited	EURO	70,—
<i>MD</i> classroom license*		
rental for a school year	EURO	199,—
purchase	EURO	599,—
<i>MD</i> campus license** for universities		
rental for an academic year	EURO	999,—
purchase	EURO	2.999,—

The M@th Desktop 8.0 Educational Software consists of 6 modules: MD, MD Functions, MD Differentiation, MD Integration, MD Lineare Algebra and the MD Statistics package. In the instructor version all examples are calculated. This version is delivered free of charge together with the classroom license or the campus license.

MD 8.0 developer license: required for EU-projects and projects between continents, source code partly included, price on application.

* A classroom license for MD products runs on up to 18 computers in a computerlab.

** A campus license for MD products runs on all computers on the campus.

