# Maple 10 Quick Reference Card

## Document Mode vs. Worksheet Mode

Maple 10 offers two primary modes of problem entry and content creation: Document mode and Worksheet mode. Both modes have respective advantages and you can easily switch from one mode to the other for maximum flexibility.

<table>
<thead>
<tr>
<th>Document Mode</th>
<th>Worksheet Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Quick problem-solving and free-form, rich content composition</td>
<td>- Traditional Maple problem-solving environment</td>
</tr>
<tr>
<td>- No prompt (&gt; displayed)</td>
<td>- Enter problems at a prompt (&gt;</td>
</tr>
<tr>
<td>- Math is entered and displayed in 2-D</td>
<td>- Math entered and displayed in 2-D or 1-D</td>
</tr>
<tr>
<td>- Press [Ctrl] (F5) to evaluate expression (inline results)</td>
<td>- Press [Ctrl] to evaluate expression</td>
</tr>
<tr>
<td>- Press [Ctrl] (F5, F6) to evaluate expression (results on new line)</td>
<td>- Solve math problems with right-click menu on math expressions</td>
</tr>
<tr>
<td>- Solve math problems with right-click menu on input and output</td>
<td>- Switch to Document mode by creating document block</td>
</tr>
<tr>
<td>- Switch to Worksheet mode by inserting prompt</td>
<td></td>
</tr>
</tbody>
</table>

Document mode lets you create rich content. For example, the following solves for $x$ without any commands: $\frac{x - 2}{a} = 1 \rightarrow (x = 2 + a)$

$$\text{solve} \left[ \frac{x - 2}{a}, x \right] = 2 + a$$

### Toggle Math/Text entry mode
- [Ctrl] (F5) on toolbar

### Evaluate math expression and display result inline
- [Ctrl] (F5) on toolbar

### Evaluate math expression and display result on new line
- [Ctrl] (F6) on toolbar

### Switch to Worksheet mode (insert prompt)
- [Ctrl] (F5) on toolbar

### Show hidden commands
- View → Expand Document Block

### Common Operations Available in Both Document and Worksheet Modes

- Display quick help (F1)
- Refer to previous result using equation numbers
- Recompute calculations within a highlighted selection
- Recompute all calculations in a document
- Symbol selection, e.g. $\varepsilon$
- Command completion, e.g. Lambert W function
- Perform context operation on math expression
- Insert prompt
- Insert text paragraph

### 2-D Math Editing Operations, Keyboard Shortcuts, and Operations

- Navigate through expression
- Move cursor to different level in expression, e.g. out of exponent

- Add, remove, rearrange palettes
- View → Palettes → Arrange Palettes or right-click palette

- Fraction $\frac{x}{y}$, superscript $x^n$, subscript $x_y$$x/y, x^n, x_y$

- Prime notation for derivatives, e.g. $y'' + y' = 0$

- Square root $\sqrt[n]{x}$, nth root $\sqrt[n]{x}$

- Symbol above, e.g. $x \bar{x}$, $x \bar{x}$

- To enter literal characters (_- , ^ , etc.), precede character with \\ (backslash)

- Greek letter entry mode (single letter)

- Special characters and symbols: Enter leading characters and \[tab]\[tab]

- $\pi, \theta, i, \pi, e, i, \alpha, \lambda, \alpha, \lambda, \geq, \leq, \neq, \pm$
### Expressions vs. Functions

<table>
<thead>
<tr>
<th>Operations</th>
<th>Expression $x^2y^2$</th>
<th>Function (operator) $g(x,y) = x^2y^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
<td>$f := x^2 + y^2$;</td>
<td>$g := (x,y) \rightarrow x^2y^2$;</td>
</tr>
<tr>
<td>Evaluate at $x=1, y=2$</td>
<td>evalf(f, $[x=1, y=2]$); produces 5</td>
<td>$g(1,2);$ produces 5</td>
</tr>
<tr>
<td>3-D plot for $x$ from 0 to 1, $y$ from 0 to 1</td>
<td>plot3d(f(x,y),x=0..1,y=0..1);</td>
<td>plot3d(g(x,y),x=0..1,y=0..1);</td>
</tr>
<tr>
<td>Conversion to other form</td>
<td>$f2 := 	ext{unapply}(f,x,y);$ $f2(1,2);$ produces 5</td>
<td>$g2 := g(x,1);$ $g2 + z;$ produces $x^2 + 1 + z$</td>
</tr>
</tbody>
</table>

### Important Maple Syntax
- `:=` Assignment: $a := 2; b := 3 + x; c := a + b$
- `$=` Mathematical equality: $x = 1 - \frac{1}{2}$
- `if a = 0 then ...` Boolean equality
- ` Suppress display of output` Terminate command with a colon, e.g. `1000! :`
- `Display help on topic` `?topic`

### Mathematical Operations
- Common manipulations (simplify, factor, expand, ...) Right-click expression and select from menu
- Solve equations Right-click equation $\rightarrow \text{Solve}$
- Solve numerically (floating-point) Right-click equation $\rightarrow \text{Solve Numerically}$
- Solve ODE Right-click DE expression $\rightarrow \text{Solve DE Interactively}$
- Integrate, differentiate Right-click expression $\rightarrow \text{Integrate or Differentiate}$
- Evaluate expression at a point Right-click expression $\rightarrow \text{Evaluate at a Point}$
- Create a matrix or vector Matrix palette $\rightarrow \text{Choose} \rightarrow \text{Insert}$
- Invert, transpose, solve matrix Right-click matrix $\rightarrow \text{Standard operations} \rightarrow \text{select Inverse, Transpose, ...}$
- Evaluate as floating-point Right-click expression $\rightarrow \text{Approximate}$
- Various operations and tasks Use Task Templates: Tools $\rightarrow$ Tasks $\rightarrow$ Browse

### Input and Output
- Interactive data import assistant Tools $\rightarrow$ Assistants $\rightarrow$ Import Data
- Import audio or image file Tools $\rightarrow$ Assistants $\rightarrow$ Import Data
- Publish document in HTML, LaTeX, or Microsoft® Word-RTF File $\rightarrow$ Export As $\rightarrow$ select HTML, LaTeX, or Rich Text Format

### Plotting and Animation
- Plot an existing expression Right-click expression $\rightarrow$ Plots $\rightarrow$ Plot Builder
- Plot new expression Tools $\rightarrow$ Assistants $\rightarrow$ Plot Builder
- Add new expression to existing plot Highlight and drag expression into plot
- Animation and parameter plots for functions of several variables Right-click expression $\rightarrow$ Plots $\rightarrow$ Plot Builder and select a plot type

### Units and Tolerances
- Add units to value or expression Place cursor to right of quantity. Use Units (SI) or Units (FPS) palette or right-click $\rightarrow$ Units $\rightarrow$ Affix unit.
- Add arbitrary unit $[\text{arb}]$ from Units (SI) or Units (FPS) palette and enter desired unit
- Simplify units in an expression Right-click expression $\rightarrow$ Units $\rightarrow$ Simplify
- Convert units Right-click expression $\rightarrow$ Units $\rightarrow$ Convert
- Enable automatic units simplification with (Units [Standard]);
- Enable tolerance calculations with (Tolerances);
- Tolerance quantity in 2-D Math $9 \pm 1.1$ for $9 \pm 1.1$
- Tolerance quantity in 1-D Math $9 \pm 1.1$ for $9 \pm 1.1$

### Select Interactive Tools and Utilities
- Quick introductory tour Help $\rightarrow$ Take a Tour of Maple
- Show available task templates Tools $\rightarrow$ Tasks $\rightarrow$ Browse
- Interactive Dictionary of Engineering and Mathematical terms Help $\rightarrow$ Manuals, Dictionary, and more $\rightarrow$ Dictionary
- Plot Builder Right-click expression $\rightarrow$ Plots $\rightarrow$ Plot Builder, or Tools $\rightarrow$ Assistants $\rightarrow$ Plot Builder
- ODE Analyzer Tools $\rightarrow$ Assistants $\rightarrow$ ODE Analyzer
- Data Analysis Assistant Tools $\rightarrow$ Assistants $\rightarrow$ Data Analysis
- Unit Conversion utility Tools $\rightarrow$ Assistants $\rightarrow$ Unit Converter
- Manuals (Getting Started Guide, User Manual) Help $\rightarrow$ Manuals, Dictionary, and more $\rightarrow$ Manuals
- Graphing Calculator Interface Installs as separate program. Launch from Maple Calculator icon on desktop.
- Interactive education tutors for topics in Calculus, Precalculus, and Linear Algebra Tools $\rightarrow$ Tutors