

**REQUIRED REFERENCE**

Maple Directions and Reference Page (linked to your class homework page)

**GOAL: Master and memorize all the Maple tasks in this lab**

- ✓ Discuss and then fill in the blanks with your partner before using Maple for tasks with a blank. You don't need to turn these pages in, but it is a good check to make sure you are using Maple correctly.

**F1: Quick Help List****Ctrl F1: Help****F5: Toggle between Math and Text****Open a new Document**

Use the basic "Starting with Maple" directions on the Directions and Reference Page

**Save your Document**

LastName1\_LastName2\_Intro\_Lab.mw file

**BE EXACT****Computations and Expressions (use Math input & left paragraph align)**

- The syntax for typing expressions in Maple is much like on a calculator.
- For the commands in the following, type the expression and then press Enter.
- You can use the left bar menus if you like.

E1. Compute  $32 \times 2^3 \times \cos(\pi)$  in three ways.

*Maple*

a.  $32*(2^3)*\cos(\text{Pi})$

[Select "Math" and be sure to type math input in a math box]

[Note: You need \* for multiplication,  $2^3 \cos(\text{pi})$  will not work]

b.  $32*(2^3)*\cos(\pi)$

[Use the symbol menu in the left bar]

c.  $32*(2^3)*\cos(\text{pi})$

d. What is the difference between Pi,  $\pi$  and pi in Maple? Use Text Typing and type your answer into Maple.

E2. Show the exact expression:  $3\sqrt{4} + \sqrt{9} - 11\sqrt{9^3}$

*Maple*

$3*4^{(1/2)}+9^{(1/2)}- 11*9^{(3/2)}$

Notice that the output to E2 is an exact, symbolic answer.

E3. Compute a decimal approximation of  $3\sqrt{4} + \sqrt{9} - 11\sqrt{9^3}$

*Maple*

a.  $\text{evalf}(3*4^{(1/2)}+9^{(1/2)}- 11*9^{(3/2)})$

b.  $3\sqrt{4} + \sqrt{9} - 11\sqrt{9^3}$

[Use the expression menu in the left bar]

c. What is the difference between a) and b)? Use Text Typing and type your answer into Maple.

E4. Show the expression:  $3\sqrt{a} + \sqrt{b} - 11\sqrt{b^3}$

Maple

a.  $a^{(1/2)}*3+b^{(1/2)}- 11*((b^3)^{(1/2)})$

b.  $3\sqrt{a} + \sqrt{b} - 11\sqrt{b^3}$

[Use the expression menu in the left bar]

c. What is the difference between a) and b)? Use Text Typing and type your answer into Maple.

Notice that Maple is happy to work with symbols as well as numbers.

### Graphing Functions (requires with(plots): just once at the top of file)

G1. Graph  $s(x) = x^2$  from  $x = -2$  to  $x = 3$

Maple

$plot(x^2, x=-2..3)$

[x=-2..3 sets the x range]

Right click on the plot or curve

i) (on the plot) add the title  $G1: s(x) = x^2$

[toggle to math to display properly]

ii) (on the curve) change the graph color

G2. All in the same picture; graph the three functions:

$s(x) = x^2, c(x) = x^3, f(x) = x^4$  from  $x = -2$  to  $x = 3$

Maple

$plot([x^2, x^3, x^4], x=-2..3)$

[Note the use of [] to plot multiple functions]

Right click

i) (on the plot) add the title  $G2: s(x) = x^2, c(x) = x^3, f(x) = x^4$

ii) (on each curve) change the colors so all three graphs are a different color

iii) (on each curve) change the line style so all three graphs are a different style

G3. All in the same picture; graph the three functions:  $s(x) = x^2, c(x) = x^3, f(x) = x^4$  from  $x = -2$  to  $x = 3$  and from  $y = -5$  to  $y = 10$

Maple

$plot([x^2, x^3, x^4], x=-2..3, y=-5..10)$

Right click

i) (on the plot) add the title  $G3: s(x) = x^2, c(x) = x^3, f(x) = x^4$

ii) (on the plot) add the caption: Domain  $-2 \leq x \leq 3$  Range:  $-5 \leq y \leq 10$

iii) (on each curve) change the colors and line styles so all three graphs are different

G4. Graph  $r(x) = \frac{x^2 + 2x + 1}{x^2 - 4}$  from  $x = -3$  to  $x = 3$  and from  $y = -6$  to  $y = 6$

*Maple*

`plot((x^2 + 2x + 1)/(x^2 - 4), x=-3..3, y=-6..6)`

Right click

i) (on the plot) add the title  $G4: \frac{x^2 + 2x + 1}{x^2 - 4}$

ii) (on the plot) add the caption: (with vertical asymptotes)

iii) (on the curve) change the color and line style as you like

G5. Graph  $r(x) = \frac{x^2 + 2x + 1}{x^2 - 4}$  from  $x = -3$  to  $x = 3$  and from  $y = -6$  to  $y = 6$  and show the discontinuities properly (removes the vertical lines).

*Maple*

`plot((x^2 + 2x + 1)/(x^2 - 4), x=-3..3, y=-6..6, discontinuities=true)`

Right click

i) (on the plot) add the title  $G5: \frac{x^2 + 2x + 1}{x^2 - 4}$

ii) (on the plot) add the caption: (without vertical asymptotes)

iii) (on the curve) change the color and line style as you like

## Defining and evaluating functions

F1. Define the squaring function  $s(x) = x^2$  so Maple will know what function you want  $s(x)$  to be. " := " means "is defined to be".

*Maple*

`s := x -> x^2`

[You can use `->` or an  $\rightarrow$  from the arrow menu in the left bar]

F2. Evaluate  $s(-3)$ . Maple will know  $s(x)$  is the squaring function defined in F1.

*Maple*

`s(-3)`

F3. Evaluate  $s(b)$  where  $s(x)$  is the squaring function defined in F1.

*Maple*

`s(b)`

F4. Evaluate  $\frac{s(-3+h) - s(-3)}{h}$ . Maple will use  $s(x)$ , the squaring function defined in F1.

*Maple*

$(s(-3 + h) - s(-3)) / h$

F5. Define the piecewise function  $p(x) = \begin{cases} x^2 + 1 & x < 0.5 \\ x^3 & x \geq 0.5 \end{cases}$  and evaluate at  $x=0, .5, 1$

Note this will not display this way in Maple, it will display as  $x \rightarrow$  piecewise (etc.)

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a.  $p := x \rightarrow \text{piecewise}(x < 0.5, x^2 + 1, x \geq 0.5, x^3)$

b.  $p(0), p(.5), p(1)$

F6. Graph  $p(x)$  from F5 from  $x = -2$  to  $x = 2$  and display any discontinuities properly

*Maple*

$\text{plot}(p(x), x = -2..2, \text{discont}=\text{true})$

### Limits (you can also use the limit expressions on the left bar menu)

L1. Calculate  $\lim_{h \rightarrow 0} \frac{s(-3+h) - s(-3)}{h}$  where  $s(x)$  is the squaring function defined in F1.

*Maple*

$\text{limit}( (s(-3 + h) - s(-3)) / h, h = 0)$

L2. For  $p(x)$  the piecewise function defined in F5.

a. Calculate  $\lim_{x \rightarrow 0.5} p(x)$

[Note, the answer you get does make sense]

*Maple*

$\text{limit}(p(x), x=.5)$

b. Calculate  $\lim_{x \rightarrow 0.5^+} p(x)$

*Maple*

$\text{limit}(p(x), x=.5, \text{right})$

c. Calculate  $\lim_{x \rightarrow 0.5^-} p(x)$

*Maple*

$\text{limit}(p(x), x=.5, \text{left})$

**Email subject line: Maple Introduction Lab**