You are looking at a MAPLE worksheet - a file with input commands and output results. Text input (featured in black), can be inserted by clicking on the capital T in the above menu. When done, you can insert a new MAPLE prompt by clicking the [> icon. After that, you're back in MAPLE command mode - which shows in red on the screen. Maple commands end with a semi colon (;) which produces a 'pretty print' echo in blue, or with a colon (:) which suppresses the command echo.

Here's an example of MAPLE input, evaluating to floating point (evalf) the number Pi (not PI, not pi - MAPLE is case sensitive!) to 100 decimals.

```maple
> evalf(Pi,100);
```

Pi itself is ofcourse just that - Pi:

```maple
> Pi;
```

just like the square root of 2 is ....

```maple
> sqrt(2);
```
or, in fractional exponent notation:

```maple
> 2^(1/2);
```
which subtly differs from decimal power notation .....

```maple
> 2^(0.5);
```

**Exercise:** approximate the cube root of 2 to, say, 100 digits:

```maple
> a:=c-d*I;
b:=e+f*I;
a*b;
```

Complex arithmetic is supported in MAPLE by the use of the symbol I (not i) for the square root of -1:

```maple
> a:=(2)^(1/2);
b:=2^(2/3);
a*b;
```

**Tip:** To force a complex computation to be evaluated, use the `evalc` command
Complex exponentials can be handled, too:

\[ \text{evalc} \left( \text{exp}(\theta \text{i}) \right) \]

\[ \cos(\theta) + i \sin(\theta) \]

and what about the sine value of a complex number?

\[ \text{evalc} \left( \text{sin}(\theta \text{i}) \right) \]

\[ i \sinh(\theta) \]

**Solving equations in MAPLE:**

A common task in college math is to solve an equation for a particular variable.

E.g., solving the quadratic \( 2x^2 + 4x - 4 = 0 \) for \( x \).

We start by defining the equation and assigning naming it, say, Eq1.

Note the distinction between the assignment operator, :=, and the equality, =.

Again note that implied multiplication is not recognized in MAPLE: \( 2x \) is a new name, not \( 2 \text{ times } x \)!

> Eq1 := 2*x^2 + 4*x - 4 = 0;

To solve the equation exactly and assign the outcome to sol1, use the `solve` command, to get an approximate (decimal) solution, you can use `fsolve` (solve to floating point):

> sol1 := solve(Eq1, x);

> fsol1 := fsolve(Eq1, x);

For help on `solve` or other commands, type `?` followed by the command you need help on:

> ?solve;

Polynomial equations of degree greater than 4 generally can not be solved explicitly. In these cases, implicit solutions are given in terms of RootOfs. Explicit solutions for polynomial equation up to degree 4 are not by default given because they can get too complicated to be of use. By setting the global variable `_EnvExplicit` to true then `solve` will return explicit solutions for quartic polynomials in all cases.

> _EnvExplicit := true;

Hey - we asked for it!

You could `simplify` the first part of the solution, but it'll never be pretty ....

> simplify(sol1[1]);

Does MAPLE detect false roots?

Note that the equation \((x^2 - 4)/(x-2) = 0\) has only one solution (why?)

> Eq3 := (x^2 - 4)/(x-2) = 0;

> Sol3 := solve(Eq3, x);

MAPLE can handle parameters (unknown constants) in equations ...

E.g. \(x^2 - cx + 3 = 0\), for unknown value of \(c\):

> Eq4 := x^2 - c*x + 3 = 0;

> Sol4 := solve(Eq4, x);

To substitute a value of 4 for \(c\) into the first solution (sol[1]):
\[ > \text{xval:=subs(c=4,Sol4[1]);} \]
which can, of course, be simplified:
\[ > \text{simplify(xval);} \]

**Exercises:**

1. Use MAPLE to solve the following equations for \( x \) and compare the results with your pencil and paper solution:
   a. \( \frac{(x + 2)}{(x + 2)} = 0 \)
   b. \( \frac{(x + 2)}{(x + 2)} = 1 \)

2. Use MAPLE to solve the following equations for \( x \) and compare the results with your pencil and paper solution:
   a. \( \frac{x + c}{x + 2} = 0 \)
   \[ > \]
   b. \( \frac{x + c}{x + 2} = 1 \)

3. Use MAPLE to *completely* solve the following equations for \( x \):
   a. \( x^4 - 4x^3 + 6x^2 - 8x + 8 = 0 \)
   b. \( x^4 - 16 = 0 \)

4. Use MAPLE's help facility to find a command for *expanding* a polynomial,
   (e.g. writing \((x-2)(x+3)\) as \(x^2 + x - 6\))
   and use this command to write the following equations in expanded form:
   a. \( (x - 2)^2 (x^2 + 2) = 0 \)
   b. \( (x - 2) (x + 2) (x^2 + 4) = 0 \)

5. Use MAPLE's help facility to find a command for *factoring* a polynomial,
   (e.g. writing \(x^2 + x - 6\) as \((x-2)(x+3)\))
   and use this command to write the following equations in factored form:
   a. \( x^4 - 4x^3 + 6x^2 - 8x + 8 = 0 \)
   b. \( x^4 - 16 = 0 \)

6. Use MAPLE to obtain the first 100 digits of \( e \), Euler's Number

\[ > \]