> Ten useful applications of Maple

> 1.) Maple can expand tedious expressions

> eqn1 := a+2*b+3*c+4*d+5*e=41;
> eval(eqn1, x=a/2);

> eqn:=x^3-1/2*a*x^2+13/3*x^2 = 13/6*a*x+10/3*x-5/3*a;
> expand (ex);

Also, Maple can of course verify that these are solutions.

> 2.) Maple can also solve difficult equations.

> eqn := eqn := x^3-1/2*a*x^2+13/3*x^2 = 13/6*a*x+10/3*x-5/3*a;
> solve(eqn, {x});

> evaluate(eqns, x=a/2);

> 3.) If given a system of linear equations, Maple also has the ability to compute the solutions.

> eqn1 := a+2*b+3*c+4*d+5*e=41;
> eqn1 := a + 2*b + 3*c + 4*d + 5*e = 41
> eqn2 := 5*a+5*b+4*c+3*d+2*e=20;
eqn2 := 5 \ a + 5 \ b + 4 \ c + 3 \ d + 2 \ e = 20

> eqn3 := 3\ b + 4\ c - 8\ d + 2\ e = 125;

> eqn4 := a + b + c + d + e = 9;

> solve( \{eqn1, eqn2, eqn3, eqn4\}, \{a, b, c, d\} );

\[
\left\{ \begin{array}{c}
d = -\frac{79}{13} - \frac{4}{13} e, \\
a = 2, \\
c = \frac{483}{13} - \frac{31}{13} e, \\
b = -\frac{313}{13} + \frac{22}{13} e
\end{array} \right\}
\]

> 4.) Maple can also make plots of interesting functions.

> plot(x^2*sin(1/x), x=-.3..(.3), y=-.2..(.2));

> 5.) Given a plot as above, Maple can find the limit of the function.

> ex:=x^2*sin(1/x);

> ex := x^2 \sin \left( \frac{1}{x} \right)

> limit(ex, x=0, left);
> limit(ex, x=0, right); 0
> limit(ex, x=0); 0

> 6.) Maple can also find the derivatives of such expressions.
> exprime:=diff(ex, x);

\[
exprime := 2x \sin \left( \frac{1}{x} \right) - \cos \left( \frac{1}{x} \right)
\]

> 7.) Maple can define piecewise functions as follows
> p := x -> piecewise( x<0, -1, x>1, 2*x, x^2 );

\[
p := x \rightarrow \begin{cases} 
-1 & x < 0 \\
2x & 0 < x < 1 \\
x^2 & \text{otherwise}
\end{cases}
\]

> p(x);

\[
\begin{cases} 
-1 & x < 0 \\
2x & 1 < x \\
x^2 & \text{otherwise}
\end{cases}
\]

> And again, we can take derivatives.
> p_prime := diff( p(x), x );

\[
p_prime := \begin{cases} 
0 & x = 0 \\
\text{undefined} & x = 0 \\
2x & x < 1 \\
\text{undefined} & x = 1 \\
2 & 1 < x
\end{cases}
\]

> 8.) Like differentiation, Maple can manipulate integrals as well.
> g := x -> x*cos(x) + (2*x^2+1)^4;

\[
g := x \rightarrow x \cos(x) + (2x^2 + 1)^4
\]

> h := Int( g(x), x );

\[
h := \int x \cos(x) + (2x^2 + 1)^4 \, dx
\]

> value( h );

\[
\cos(x) + x \sin(x) + x + \frac{16}{9} x^9 + \frac{32}{7} x^7 + \frac{24}{5} x^5 + \frac{8}{3} x^3
\]

> 9.) Maple is capable of computing volume and surface of revolution questions./
> with(Student[Calculus1]);
> VolumeOfRevolution(1/x^3, x=1..infinity, output=value);
\[
\frac{1}{5} \pi
\]

> 10.) Maple can also plot 3-D plots.

> smartplot3d[x,y](sin(1/5*x*y));