Tutorial on solving first-order differential equations with Maxima.

Here's how you enter a first-order ODE. Note the ' before the diff operator. This tells Maxima to not try and evaluation the derivative, but to just keep it as a symbolic expression.

```maxima
(%i1) eqn:'diff(y,x)+y=0;
(%o1) \frac{dy}{dx} + y = 0
```

Once you have entered the ODE, the ode2 command will attempt to solve it. This can be typed in directly, entered from the Equations menu, or accessed from the Solve ODE... button at the bottom of the screen.

```maxima
(%i2) gsoln:ode2(eqn, y, x);
(%o2) y = %c \, %e^{-x}
```

Your general solution contains an arbitrary constant %c whose value is determined by imposing initial conditions. The ic1 command does this: (Initial value problem (1)) in the Equations menu or enter it directly as shown.

```maxima
(%i3) soln:ic1(gsoln, x=0, y=2);
(%o3) y = 2 \, %e^{-x}
```

To solve an inhomogeneous equation, just replace the 0 on the right-hand side with the forcing function. The proceed as before.

```maxima
(%i4) eqn:'diff(y,x)+4*y=sin(x);
(%o4) \frac{dy}{dx} + 4 \, y = \sin(x)
```

```maxima
(%i5) gsoln:ode2(eqn, y, x);
(%o5) y = \frac{\%e^{-4 \, x} \times (\%e^{4 \times \sin(x)} - \cos(x))}{17} + \%c
```

```maxima
(%i6) soln:ic1(gsoln, x=0, y=1);
(%o6) y = \frac{\%e^{-4 \, x} \times (4 \, \%e^{4 \times \sin(x)} - \%e^{4 \times \cos(x)} + 18)}{17}
```

/*
If Maxima can't find a closed form solution to your equation it may give you a formal solution, in terms of an integral, say.

(%i7) 'diff(y,x)+exp(-sin(x)^2)*y=0;
(%o7) \frac{d}{dx} y + e^{-\sin(x)^2} y = 0

(%i8) ode2(% , y, x);
(%o8) y = \%c e^{-\int e^{-\sin(x)^2} \, dx}

(%i9)