

## Solution of Differential Equation

The MATLAB command **dsolve** computes symbolic solutions to ordinary differential equations. The dependent variables are those preceded by D and the **default independent variable is t**. *Note that names of symbolic variables should not contain D*. The independent variable can be changed from t to some other symbolic variable by including that variable as the last input argument. (See examples below)

Initial conditions can be specified by additional equations. If initial conditions are not specified, the solutions contain constants of integration, C1, C2, etc.

You can call **dsolve** with the number of output variables equal to the number of dependent variables or place the output in a structure whose fields contain the solutions of the differential equations.

### Example 1

The following call to dsolve

```
dsolve('Dy=1+y^2')
```

uses y as the dependent variable and t as the default independent variable.

The output of this command is

```
ans =
```

```
tan(t+C1)
```

To specify an initial condition, use

```
y = dsolve('Dy=1+y^2','y(0)=1')
```

This produces

```
y =
```

```
tan(t+1/4*pi)
```

### Example 2

Nonlinear equations may have multiple solutions, even when initial conditions are given.

```
x = dsolve('(Dx)^2+x^2=1','x(0)=0')
```

results in

```
x =
```

```
[-sin(t)]
```

```
[ sin(t)]
```

Change of Dependent Variable: To change dependent variable from t to x input DE as

```
y= dsolve('Dy=1+y^2','x')
```

The output solution will now be in terms of x.