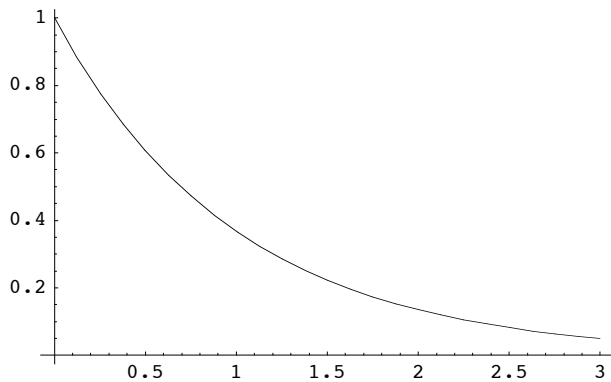


Solving a differential equation numerically in Mathematica is pretty simple. Use the "NDSolve" command, and indicate the system of equations, including the initial conditions. Make sure to indicate the dependence on the independent variable explicitly. Here is the solution to $dy/dx = -y$ (just a decaying exponential), with $y(0)=1$. The solution runs from $x=0$ to $x=3$.

```
In[4]:= solution = NDSolve[{y'[x] == -y[x], y[0] == 1}, y, {x, 0, 3}]
```

```
Out[4]= {{y → InterpolatingFunction[{{0., 3.}}, <>]}}
```

```
In[5]:= Plot[y[x] /. solution, {x, 0, 3}]
```



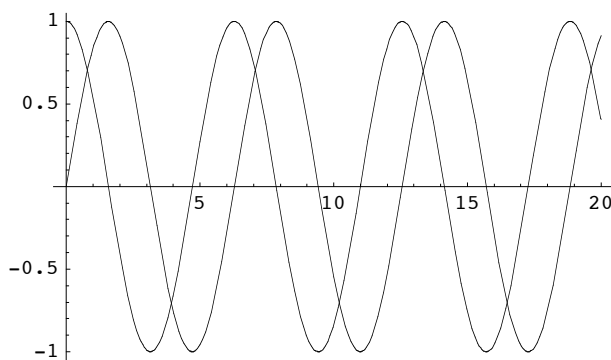
```
Out[5]= - Graphics -
```

Here is an example of a pair of coupled differential equations, plotted simultaneously. This is the harmonic oscillator ($dp/dt = -x$, $dx/dt = p$). Note that you might also have to plot the solutions separately to tell which is which. Note that not all the simultaneous equations need to be differential equations...

```
In[17]:= solution = NDSolve[{p'[t] == -x[t], x'[t] == p[t], p[0] == 1, x[0] == 0}, {p, x}, {t, 0, 20}]
```

```
Out[17]= {{p → InterpolatingFunction[{{0., 20.}}, <>],  
          x → InterpolatingFunction[{{0., 20.}}, <>]}}
```

```
In[18]:= Plot[{p[t] /. solution, x[t] /. solution}, {t, 0, 20}]
```



```
Out[18]= - Graphics -
```