Solving ODEs using MatLab

A command used to solve ODEs in MatLab (a solver) is ode45

Enter

```
>> help ode45
```

to see information about this command. Note that all commands and variables in MatLab help are written in capitals.

The first argument of ode45 is a function. It is convenient to program it in a separate file.

Consider, for instance the equation

$$y' = \frac{\cos t}{2y - 2}$$

Program the function in the right-hand side of the equation in the file example1.m using MatLab editor.

```
function yprime=example1(t,y)
yprime=cos(t)/(2*y-2);
```

Then type

```
>> [t, y]=ode45(@example1,[0, 4*pi],3);
>> plot(t, y)
```

We will find a table of values of the function y at values of t from 0 to 4π. The initial value of y at $t = 0$ will be 3, which is entered as the last entry of ode45.

The command plot(t, y) will plot the graph of the function y on the interval $[0, 4\pi]$.

Example. Use ode45 to plot the solution of the initial value problem

$$y' + y + y^3 = \cos^2 t, \quad y(0) = -3$$