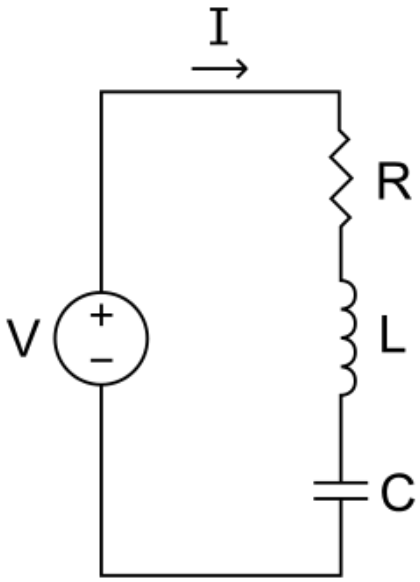
Mathematical Modelling - Assignment 6: Solving a 2nd-order DE with Matlab and Simulink.

Extra information: Sometimes you would like to select a single row or a single column form a matrix. Matlab offers a way to do it.
Try:
```
M = rand(2,5)
row1 = M(1,:)
column2 = M(:,2)
```

Assignment 1: Solving a 2nd-order DE with Matlab

Given is the following RLC-circuit:



[*reference: https://en.wikipedia.org/wiki/RLC_circuit*]

In case of a DC-Voltage source, the differential equation belonging to this circuit is equal to

$$\frac{d^2I(t)}{dt^2}+\frac{R}{L}\frac{dI(t)}{dt}+\frac{1}{LC}I(t)=0$$

The theoretical derivation of this differential equation can be found in the Wikipedia reference given above.

(a) Rewrite this second-order differential equation to a system of two first-order equations.

(b) Given is *L=1 H*, *C =1F*, *I(0) = 0 A*, $\left.\frac{dI(t)}{dt}\right|_{t=0} = 4A/s$

Make a plot of the current I(t) for the time period from t = 0 to 20 seconds, using five different resistor values of *R* being 0.25 Ω, 0.5 Ω, 1 Ω, 2 Ω and 4 Ω, using the Matlab command `ode45`. Plot the results for the different resistor values together in one single graph. Don't forget to use a title, correct labels for the x- and y-axis and a legend too.

Assignment 2: Solving a 2nd-order DE with Simulink.

Solve assignment 1 by making a Simulink model instead of. solving it by Matlab code.
To implement the model, you should use summation blocks, integrating blocks and/or gain blocks as well as a scope and input sources. Plot the results for the different resistor values together in one single scope. Make use of a legend in the scope.
Finally, check of you obtain the same result as in assignment 1.