Laboratory 6 - 28/11/16

Consider the following problem:

$$\begin{cases} -\dfrac{d^2y}{dx^2} = f(x), \quad x \in (0, L) \\ y(0) = y_0, \\ y(L) = y_L, \end{cases} \tag{1}$$

with $y_0 = y_L = 0$ and $L = 1$.

1) Implement a Matlab function that solves problem (1) with the second order and centered finite difference scheme.

2) Solve the proposed problem with $f(x) = 1$, which has exact solution given by $y(x) = \frac{1}{2}x(1-x)$, with a space discretization step $h = 0.025$.

3) Evaluate the order of accuracy of the method for problem (1) in the following two cases:

   a) $f(x) = 1$, with exact solution $y(x) = \frac{1}{2}x(1-x)$;

   b) $f(x) = 4\pi^2 \cos(2\pi x)$, with exact solution $y(x) = \cos(2\pi x) - 1$.