6. Coding: Boundary Value Problem

Implement the finite difference method of Section 2.4 (in the book) for the equation

$$-u'' = f, \qquad u(0) = 0, \qquad u(1) = 0$$

in Python. Plot the results for $f = 1$ and $f = \text{sign}(x - 0.5)$ using $m = 100$ grid points.

Hint: There are many ways to implement this. E.g. you can use the functions

```
numpy.linspace
scipy.sparse.diags
scipy.sparse.linalg.spsolve
```