Objectives.
(1) Define Sobolev spaces
(2) Build some intuition behind the spaces
(3) Show existence and uniqueness of FEM solutions

TODO.
(1) Read sections 2.6.1 and 2.6.2 in the FEniCS book.
   • What is the weak derivative of a function $f$?
   • Suppose $f$ is continuously differentiable, what is the weak derivative?
   • What is the weak derivative of
     \[
     f(x) = \begin{cases} 
     0 & \text{if } x \leq 0 \\
     x & \text{if } x > 0
     \end{cases}
     \]
   • What is the weak derivative of
     \[
     f(x) = \begin{cases} 
     0 & \text{if } x \leq 0 \\
     1 & \text{if } x > 0
     \end{cases}
     \]
   • What is a b.l.f? Given an example of a b.l.f.

   • What is a bilinear form? Give an example.

   • What is continuity?

   • What is coercivity?

   • Suppose $V = \mathbb{R}^n$ and $u, v \in V$. Let $A$ be an $n \times n$ matrix and define
     \[
     a(u, v) = \langle Au, v \rangle.
     \]
     Is $a(\cdot, \cdot)$ a linear form? Is it coercive and continuous?

   • Suppose that
     \[
     a(u, v) = \langle u_x, v_x \rangle.
     \]
     Is $a(\cdot, \cdot)$ a linear form? Is it coercive and continuous?