

## Exercices

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### 1.1 Weak forms

#### 1.1.1 Basic exercices (MRAC/INPAM/ATVE/IMDEA)



**Exercise 1.1.** What is the weak form associated to problem

$$u''(x) + u(x) = 0 \text{ on } ]0; 1[, \quad u(0) = 0, \quad u'(1) = 1. \quad (1.1)$$



**Exercise 1.2.** What is the weak form associated to problem

$$u''(x) + u'(x) + u(x) = f(x) \text{ on } ]0; 1[, \quad u(0) = 0, \quad u(L) = 1. \quad (1.2)$$



**Exercise 1.3.** Let consider the 1D acoustic cavity harmonic problem at circular frequency  $\omega$ :

$$\Omega = ]0; L[, \quad p''(x) + k^2 p = 0, \quad k = \frac{\omega}{c}, \quad c = \sqrt{\frac{K}{\rho}}. \quad (1.3)$$

$k$  is the wave number,  $c$  is the sound velocity,  $K$  is the compressibility and  $\rho$  is the density.

- What is the weak form associated to this problem with boundary conditions

$$p'(0) = 0, \quad p'(L) = -\rho\omega^2. \quad (1.4)$$

- What is the physical significance of the boundary condition in  $x = L$



**Exercise 1.4.** • What is the weak form associated to problem

$$p''(x) + k^2 p(x) = 0 \text{ on } ]0; L[, \quad p'(0) = 0, \quad p'(1) = \rho\omega^2. \quad (1.5)$$

- What is the physical significance of the boundary condition in  $x = 1$

### 1.1.2 Advanced exercises (MRAC/INPAM)