EXAMEN DU SEMESTRE HARMATTAN
EPREUVE : MTH2121
DURÉE : 2H00

Exercice 1
By the Laplace transform method, solve

1. $$\begin{cases} u_t = u_{xx} - hu, \quad 0 < x < \pi,\ t > 0 \\ u(x,0) = \sin x, \quad 0 \le x \le \pi \\ u(0,t) = u(\pi,t) = 0, \quad t > 0 \end{cases}$$

2. $$\begin{cases} u_{tt} = u_{xx} + h, \quad 0 < x < \pi,\ t > 0 \\ u(x,0) = u_t(x,0) = 0, \quad 0 \le x \le \pi \\ u_x(0,t) = u_x(\pi,t) = 0, \quad t > 0 \end{cases}$$

Exercice 2
By the separation of variable method, solve the radioactive decay problem :

$$\begin{cases} u_t - ku_{xx} = Ae^{-ax}, \quad 0 < x < \pi,\ t > 0 \\ u(x,0) = \sin x, \quad 0 < x < \pi, \\ u(0,t) = u(\pi,t) = 0, \quad t > 0 \end{cases}$$

where A, k and a are the constants.