

MATH4564 - Review for Test No2 - Fall 03 - Konaté

Notice: Show your work. A right answer with a bad reasoning will be considered as wrong.

PROBLEM 1 •

Use the Laplace Transform method to solve the differential equation:
$$\begin{cases} y'' - 4y' + 13y = 1 \\ y(0) = 0 \quad y'(0) = 0 \end{cases}$$

PROBLEM 2 • Consider the following partial differential problem

$$\begin{cases} (x+1)\frac{\partial^2 u}{\partial x^2} + 2\sqrt{3}\frac{\partial^2 u}{\partial x \partial y} + (x-1)\frac{\partial^2 u}{\partial y^2} - xy = 0 \\ -\frac{\partial u}{\partial x}(0) = y \quad \frac{\partial u}{\partial x}(2) = 5 \\ u(x, 0) = 0 \end{cases}$$

1. Find the type of the equation (elliptic, hyperbolic or parabolic) as function of x and y ;
- 2- Say which kind of boundary conditions has the equation;

PROBLEM 3 • Say if the function has a sine and a cosine Fourier series:

$$f(x) = \begin{cases} x^2 & 0 < x < 1 \\ e^x & 1 < x < 2 \end{cases}$$

Set-up (only) its sine and cosine Fourier series (do not compute the coefficients)

PROBLEM 4 •

$$\begin{cases} 4u_{xx} = u_t & 0 < x < 5 ; t > 0 \\ u(0, t) = 0 \quad u(5, t) = 0 & t > 0 \\ u(x, 0) = x \end{cases}$$

- 1- What is the type of the problem and the type of its boundary conditions?
- 2- Solve the problem.

PROBLEM 5 •

$$\begin{cases} u_{xx} = u_t & 0 < x < 3 ; t > 0 \\ u(0, t) = 2 \quad u(3, t) = 10 & t > 0 \\ u(x, 0) = \frac{8x}{3} + 2 + 2 \sin \pi x - 3 \sin 4\pi x \end{cases}$$

- 1- What is the type of the problem and the type of its boundary conditions??
- 2- Solve the problem.