# Lecture 4 Activity Results for Test Student

Score for this attempt: **1** out of 1
Submitted Jan 18 at 3:05pm
This attempt took 7 minutes.

## Question 1

1 / 1 pts

Consider the 1D wave equation $u_{tt} = c^2 u_{xx},\ x \in (0, L)$.

Which of the following is true? **Select all that apply.**

- [ ] $u(x,t) = \sin(\frac{n\pi}{L}x)\sin(\frac{cn\pi}{L}t)$ is a traveling wave.

Correct!

- [x] $u(x,t) = \sin(\frac{n\pi}{L}x)\sin(\frac{cn\pi}{L}t)$ is a standing wave.

- [ ] $u(x,t) = \sin(\frac{n\pi}{L}(x - ct))$ is a traveling wave to the left.

Correct!

- [x] $u(x,t) = \sin(\frac{n\pi}{L}(x - ct))$ is a traveling wave to the right.

Correct!

- [x] $u(x,t) = \sin(\frac{n\pi}{L}(x + ct))$ is a traveling wave to the left.

Additional Comments:

## Question 2

0 / 0 pts

Recall Theorem 1: the solution of $\begin{cases} u_{tt} = c^2 u_{xx} \\ u(0,t) = 0, \quad u(L,t) = 0 \\ u(x,0) = f(x), \quad u_t(x,0) = 0 \end{cases}$

is

$u(x,t) = \dfrac{1}{2}\big(F(x-ct) + F(x+ct)\big)$ where *F*(*x*) is the odd + periodic extension of *f*(*x*).

For $f(x) = \sin(\frac{\pi}{L}x)$, use the theorem to solve the IVBP.

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- $u(x,t) = \sin(\frac{\pi}{L}(x+ct))$
- $u(x,t) = \sin(\frac{\pi}{L}(x-ct))$
- Correct! $u(x,t) = \frac{1}{2}\Big(\sin(\frac{\pi}{L}(x-ct)) + \sin(\frac{\pi}{L}(x+ct))\Big)$
- $u(x,t) = \frac{1}{2}\Big(\sin(\frac{\pi}{L}\big|x-ct\big|) + \sin(\frac{\pi}{L}\big|x+ct\big|)\Big)$
- $u(x,t) = \sin(\frac{\pi}{L}\big|x-ct\big|)$

Additional Comments:

## Question 3

0 / 0 pts

Recall Theorem 2: the solution of $\begin{cases} u_{tt} = c^2 u_{xx} \\ u(0,t) = 0, \quad u(L,t) = 0 \\ u(x,0) = 0, \quad u_t(x,0) = g(x) \end{cases}$

is

$u(x,t) = \dfrac{-1}{2c}\big(G(x-ct) - G(x+ct)\big)$ where

$G(x) = \displaystyle\int_0^x g_2(s)ds$ and $g_2(x)$ is the odd + periodic extension of

$g(x)$.

For $g(x) = \sin(\dfrac{\pi}{L}x)$, find function $G(x)$.

- $G(x) = 1 - \cos(\dfrac{\pi}{L}x)$
- $G(x) = \dfrac{L}{\pi}\cos(\dfrac{\pi}{L}x)$

Correct!

- $G(x) = \dfrac{L}{\pi}\Big(1 - \cos(\dfrac{\pi}{L}x)\Big)$
- $G(x) = \cos(\dfrac{\pi}{L}x)$
- $G(x) = \dfrac{L}{\pi}\Big(\cos(\dfrac{\pi}{L}x) - 1\Big)$

Additional Comments:

## Question 4

0 / 0 pts

Consider the IBVP $\begin{cases} u_t = -2u_{xx}\,, \quad t > 0 \\ u(0,t) = 0, \quad u(L,t) = 0\,. \\ u(x,0) = f(x) \end{cases}$

Which statement below is true?

- It is well-posed for all *f*(*x*).
- Correct! It is ill-posed for all *f*(*x*).
- It is well posed for $f(x) = 1$.
- It is well posed for $f(x) = \sin(\frac{\pi}{L}x)$.
- It is well posed for $f(x) = 0$.

Additional Comments:

## Question 5

0 / 0 pts

Consider the IBVP $\begin{cases} u_t = 2u_{xx}\,, & t > 0 \\ u(0,t) = 0, & u(L,t) = 0\,. \\ u(x,0) = f(x) \end{cases}$

Which statement below is true?

Correct!

- It is well-posed for all $f(x)$.
- It is ill-posed for all $f(x)$.
- It is ill-posed for $f(x) = -1$.
- It is ill-posed for $f(x) = \sin(\frac{n\pi}{L}x)$.
- It is ill-posed for $f(x) = \begin{cases} -1, & x \in (0, L/2) \\ +1, & x \in (L/2, L) \end{cases}$.

Additional Comments:

## Question 6

0 / 0 pts

Consider the IBVP $\begin{cases} u_{xx} + u_{yy} = 0 \\ u(0,y) = 0, \quad u(L,y) = 0 \\ u(x,0) = 0, \quad u_y(x,0) = f(x) \end{cases}$.

Which statement below is true?

Correct!

- It is well-posed for all *f*(*x*).
- It is ill-posed for all *f*(*x*).
- It is well posed for $f(x) = 1$.
- It is well posed for $f(x) = \sin(\frac{\pi}{L}x)$.
- It is well posed for $f(x) = 0$.

Additional Comments:

## Question 7

0 / 0 pts

Classify $u_{xx} - u_{xy} + u_{yy} - ku_y + q = 0$ as hyperbolic, parabolic or elliptic.

- It is hyperbolic.

It is parabolic.

Correct!

It is elliptic.

Its classification depends on coefficient *k*.

Its classification depends on coefficient *q*.

Additional Comments:

Fudge Points:

You can manually adjust the score by adding positive or negative points to this box.

**Final Score:** 1 out of 1

Update Scores