Lecture 2 Activity Results for Test Student

Score for this attempt: **1** out of 1

Submitted Jan 11 at 3:01pm

This attempt took 8 minutes.

Question 1

1 / 1 pts

Consider function $f(x), x \in (0, L)$ and consider its Fourier COSINE series:

$$f(x) = \frac{a_0}{2} + \sum_{n=1}^{+\infty} a_n \cos(\frac{n\pi}{L}x) \equiv f_{\cos}(x).$$

Function $f_{\cos}(x)$ is defined for all *x*, not limited to $x \in (0, L)$. Which statement below is true?

- $f_{\cos}(x)$ is an even function, periodic with period = *L*.
- $f_{\cos}(x)$ is an odd function, periodic with period = *L*.
- Correct! $f_{\cos}(x)$ is an even function, periodic with period = 2*L*.
- $f_{\cos}(x)$ is an odd function, periodic with period = 2*L*.
- In general, $f_{\cos}(x)$ is neither even nor odd.

Additional Comments:

Question 2

0 / 0 pts

Consider function $f(x) = \sin(\frac{\pi}{L}x) + \frac{1}{3}\sin(\frac{3\pi}{L}x), x \in (0, L)$. Find its Fourier SINE series.

- $f(x) = \sin(\frac{\pi}{L}x) + \frac{1}{3}\sin(\frac{3\pi}{L}x) + \frac{1}{5}\sin(\frac{5\pi}{L}x) + \cdots$

Correct!

- $f(x) = \sin(\frac{\pi}{L}x) + \frac{1}{3}\sin(\frac{3\pi}{L}x)$
- $f(x) = \sin(\frac{\pi}{L}x)$
- $f(x) = \sin(\frac{\pi}{L}x) + \frac{1}{2}\sin(\frac{2\pi}{L}x) + \frac{1}{3}\sin(\frac{3\pi}{L}x) + \cdots$
- $f(x) = \sin(\frac{\pi}{L}x) + \sin(\frac{3\pi}{L}x)$

Additional Comments:

Question 3

0 / 0 pts

Consider the eigenvalue problem $\begin{cases} X''(x) = -\lambda X(x) \\ X'(0) = 0, \quad X'(L) = 0 \end{cases}$.

The eigenvalues and eigenfunctions are

- $\lambda_n = (\frac{n\pi}{L})^2, \quad X_n(x) = \sin(\frac{n\pi}{L}x), \quad n = 1, 2, \ldots$
- $\lambda_n = (\frac{n\pi}{L})^2, \quad X_n(x) = \cos(\frac{2n\pi}{L}x), \quad n = 0, 1, 2, \ldots$
- $\lambda_n = (\frac{2n\pi}{L})^2, \quad X_n(x) = \cos(\frac{2n\pi}{L}x), \quad n = 0, 1, 2, \ldots$

Correct!

- $\lambda_n = (\frac{n\pi}{L})^2, \quad X_n(x) = \cos(\frac{n\pi}{L}x), \quad n = 0, 1, 2, \ldots$
- $\lambda_n = (\frac{n\pi}{L})^2, \quad X_n(x) = \cos(\frac{n\pi}{L}x), \quad n = 1, 2, \ldots$

Additional Comments:

Question 4

0 / 0 pts

Recall that in the complex plane, we have $e^{in\pi} = (-1)^n$. Use it to calculate $\cos(n\pi)$ and $\sin(n\pi)$.

$\cos(n\pi) = 1$ and $\sin(n\pi) = 0$

Correct!

$\cos(n\pi) = (-1)^n$ and $\sin(n\pi) = 0$

$\cos(n\pi) = 0$ and $\sin(n\pi) = (-1)^n$

$\cos(n\pi) = (-1)^n$ and $\sin(n\pi) = (-1)^n$

$\cos(n\pi) = 0$ and $\sin(n\pi) = 0$

Additional Comments:

Question 5

0 / 0 pts

Consider the eigenvalue problem $\begin{cases} X''(x) = -\lambda X(x) \\ X(0) = 0, \quad X'(L) = 0 \end{cases}$.

The eigenvalues and eigenfunctions are

$\lambda_n = (\frac{n\pi}{L})^2, \quad X_n(x) = \sin(\frac{n\pi}{L}x), \quad n = 1, 2, \ldots$

$\lambda_n = (\frac{n\pi}{L})^2, \quad X_n(x) = \cos(\frac{n\pi}{L}x), \quad n = 0, 1, 2, \ldots$

$$\lambda_n = (\frac{(n-\frac{1}{2})\pi}{L})^2, \quad X_n(x) = \cos(\frac{(n-\frac{1}{2})\pi}{L}x), \quad n = 1, 2, \ldots$$

$$\lambda_n = (\frac{(n-\frac{1}{2})\pi}{L})^2, \quad X_n(x) = \sin(\frac{(n-\frac{1}{2})\pi}{L}x), \quad n = 0, 1, 2, \ldots$$

Correct!

$$\lambda_n = (\frac{(n-\frac{1}{2})\pi}{L})^2, \quad X_n(x) = \sin(\frac{(n-\frac{1}{2})\pi}{L}x), \quad n = 1, 2, \ldots$$

Additional Comments:

Question 6

0 / 0 pts

Consider the IBVP $\begin{cases} u_t = ku_{xx} \\ u(x,0) = 0 \\ u(0,t) = 1, \quad u(L,t) = -1 \end{cases}$.

Can we apply separation of variables directly to solve this IBVP?

True

Correct!

False

Additional Comments:

Question 7

0 / 0 pts

Consider the IBVP $\begin{cases} u_t = ku_{xx} \\ u(x,0) = 0 \\ u(0,t) = 1, \quad u(L,t) = -1 \end{cases}$.

The steady state solution $u_\infty(x)$ satisfies

$$\begin{cases} u''_\infty(x) = 0 \\ u_\infty(0) = 1, \quad u_\infty(L) = -1 \end{cases}.$$

Find $u_\infty(x)$.

- $u_\infty(x) = -x/L$
- $u_\infty(x) = 1 - x/L$

Correct!

- $u_\infty(x) = 1 - 2x/L$
- $u_\infty(x) = 1 - 2(x/L)^2$
- $u_\infty(x) = 1 - 2(x/L)^3$

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