

3. Lecture 6

The following can be done after Lecture 6.

Please enter solutions in terms of π rather than numerical approximations to guarantee a correct grading. Simply type **pi** into the answer box and treat as any other variable, using * to denote multiplication, / to denote division, and ^ to denote exponents.

6-1

10.0/10.0 points (graded)

Consider the wave equation

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2},$$

with boundary conditions $u(0, t) = 0$ and $u(\pi/2, t) = 0$ for all $t \geq 0$.

This models a vibrating string. Find the positive number r such that the general solution is a linear combination of the functions $\sin(rkx) \cos(2kct)$ and $\sin(rkx) \sin(2kct)$ as k ranges over positive integers.

r=

✓ Answer: 2



Solution:

Substituting $u(x, t) = \sin(rkx) \cos(2kct)$ into the PDE yields

$$-(2kc)^2 \sin(rkx) \cos(2kct) = c^2 (-(rk)^2 \sin(rkx) \cos(2kct)),$$

so r must be 2.

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You have used 1 of 15 attempts

i Answers are displayed within the problem

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