**Partial differential equations**

**Homework**

**Task 6. String oscillation, second boundary problem**

**Methodical instructions**

Consider a string with length *L.* Its oscillation is described by the equality

*utt = a2uxx*, 0 < *x* < *L*, *t* > 0.

The initial profile and the initial velocity distribution are known. Then we have the initial conditions

*u*(*x*,0) = *ϕ*(*x*), *ut*(*x*,0) = *ψ*(*x*), 0 < *x* < *L*,

where the functions *ϕ* and *ψ* are given. The ends of the string are free. So, we have the boundary conditions

*ux*(0,*t*) = 0, *ux*(*L*,*t*) = 0, *t* > 0.

Table of parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| variant | *L* | *a* | *ϕ*(*x*) | *ψ*(*x*) |
| 1 | π | 1 | 0 | cos *x* |
| 2 | 1 | 1 | 0 | -cos π*x* |
| 3 | 2 | 2 | 0 | cos 2π*x* |

**Actions**

It is necessary perform the following steps:

1. Using the method of variable separation, find the solution of the problem.
2. Check that this is, in reality the solution.
3. Show the graph (position of the string for the different time points).
4. Give the physical interpretation of the results.

Use the example from the lecture as the sample.