**Partial differential equations**

**Homework**

**Task 9. Heat equation. Second boundary problem**

**Methodical instructions**

Consider a body with length *L.* The heat transfer is described by the heat equation

*ut = a2uxx*, 0 < *x* < *L*, *t* > 0,

where *u* is the temperature, *a* is the coefficient of the thermal conductivity.

The initial temperature *ϕ* is known. Then we have the initial condition

*u*(*x*,0) = *ϕ*(*x*).

We have the boundary conditions

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

i.e. the ends of the body are isolated.

Table of parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Variant | *L* | *a* | *ϕ*(*x*) |
| 1 | π | ½ | -cos *x* |
| 2 | 2π | 1 | cos *x* |
| 3 | 1 | 2 | cos 2π*x* |

**Actions**

It is necessary perform the following steps:

1. Find the solution of the problem.
2. Check that this is, in reality the solution.
3. Show the graph (temperature of the body for the different time moment).
4. Give the physical interpretation of the results.

Use the example from the lecture as the sample.