SOME PROBLEMS OF HEAT DISTRIBUTION ANIMATION OF SOLUTIONS USING MAPLE MATHEMATICAL SYSTEM

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ANNOTATION

In the given job the ways of the decision and them animations with the help of system Maple the differential equations in private derivative describing tasks thermal conductivity are shown.

Keywords: thermal conductivity, differential equation, task, core, entry condition, boundary condition, Maple.

It is known that heat spread , vibration issues dynamic issues they are often private derivative differential or integrodifferential equations with is expressed [1-4,6-8]. Most simple heat spread to the issue example in the stern heat spread issue is parabolic type private derivative differential equations with is expressed [6]. in Sturgeon heat spread circle issues of solving one how many analytical methods in textbooks given [6]. But taken solutions modern computers and software supplies through harvest to do not shown . Such issues solve methods one is Maple math system is to use [5,7,8] . That's why for this on the ground in the stern heat spread circle some Maple math problems system using to solve , solutions animations harvest to do and from him lesson in the process use the ways seeing let's go

First of all, let's consider the process of heat propagation in a semi-confined sturgeon. For this, this equation

$$\frac{\partial}{\partial t}u(t,x)=a^2\left(\frac{\partial^2}{\partial x^2}u(t,x)\right)$$

the following initial condition

$$u(0,x)=f(x),$$

and this ch e collateral a must with let's say :

$$u(t,0)=T0$$

ie st e rjnni ch e garage in $x=0$ nu q tas one different temperature will be saved .

in [8] is marginal a must $\frac{\partial}{\partial t}u(t,0)=0$ taken as was In it q is carved issue variables separate method in the Maple system with solve commands sequence and harvest will be results given . The solution the following in appearance harvest done

$$u(t,x):=\frac{1}{2}\left(\frac{1}{a\sqrt{\pi t}}\int_{-\infty}^{\infty}f(\xi)e^{\left(-\frac{(x-\xi)^2}{4a^2t}\right)}d\xi\right)$$

Now behind the wheel k is indicated

$$u(t,0)=T0$$

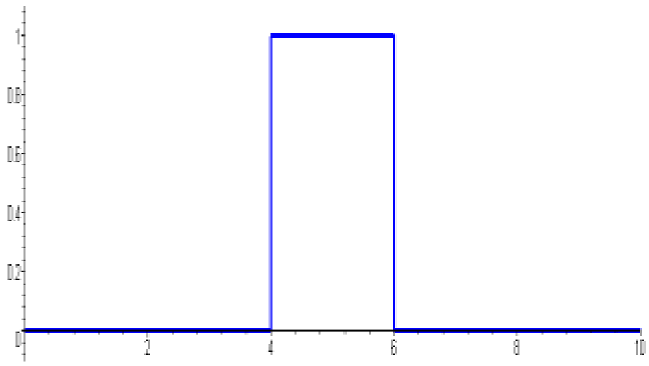
ch e collateral condition h account received solution appearance we bring The appearance of the solution created using Maple system commands is as follows[8]

$$u(t,x):=\left(-erf\left(\frac{x}{2a\sqrt{t}}\right)+1\right)T0+\frac{1}{2}\left(\frac{1}{a\sqrt{\pi t}}\int_{-\infty}^{\infty} f(\xi)e^{\left(-\frac{(-\xi+x)^2}{4a^2t}\right)}-e^{\left(-\frac{(\xi+x)^2}{4a^2t}\right)}\right)d\xi$$

This the solution sure one T_0 and $f(x)$ for s animations harvest to do for example we bring

An example . $T_0=0$, $f(x)=\begin{cases}T_0, & x<l,\\ \alpha+T_0, & l\le x\le L,\\ 0, & x>L\end{cases}$ being _$a=1,\ l=4,\ L=6,\ \alpha=1$ let it be

$f(x)$ function graph as follows



> restart;
f(xi):= xi->piecewise(xi<l,T0, xi<L,alpha+T0, xi>L,0);

The solution formula we bring :

> u(t,x):=simplify((-erf(1/2*x/a/t^(1/2))+1)*T0+1/2*1/a/(Pi*t) ^(1/2)*int(f(xi)*(exp(-1/4*(-xi+x)^2/a^2/t)-exp(-1/4*(xi+x) ^2/a^2/t)),xi = l .. L));

$$u(t,x):=-T0erf\left(\frac{x}{2a\sqrt{t}}\right)+T0-\frac{1}{2}cerf\left(\frac{l+x}{2a\sqrt{t}}\right)+\frac{1}{2}cerf\left(\frac{l+x}{2a\sqrt{t}}\right)+\frac{1}{2}cerf\left(\frac{L-x}{2a\sqrt{t}}\right)-\frac{1}{2}cerf\left(\frac{L+x}{2a\sqrt{t}}\right)$$

> T 0:= 0; a:=1;l:=4;L:=6;alpha:=1;

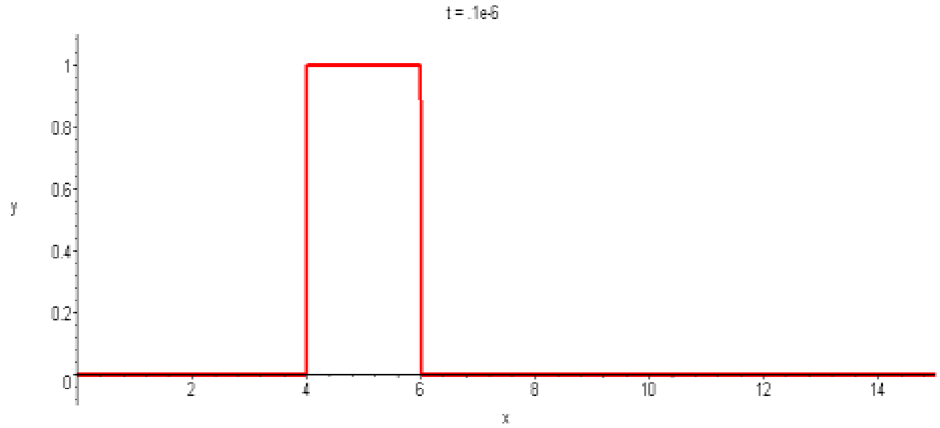
Eq the solution $T_0=0$, $a=1,\ l=4,\ L=6,\ \alpha=1$ when appearance :

> with(plots):
u(t,x):=-T0*erf(1/2*x/a/t^(1/2))+T0+1/2*erf(1/2*(-l+x)/a /t^(1/2))+1/2*erf(1/2*(l+x)/a/t^(1/2))+1/2*erf(1/2*(Lx) /a/t^(1/2))-1/2*erf(1/2*(L+x)/a/t^(1/2));

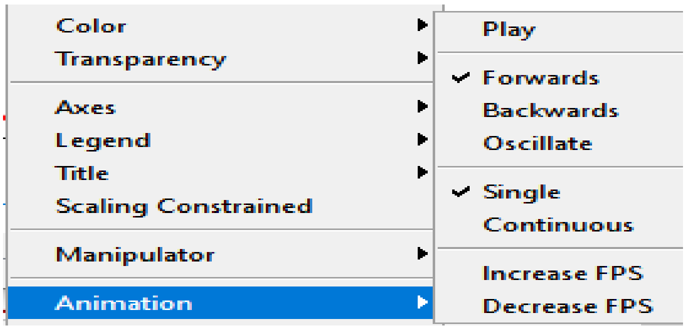
$$u(t,x):=\frac{1}{2}erf\left(\frac{-4+x}{2\sqrt{t}}\right)+\frac{1}{2}erf\left(\frac{4+x}{2\sqrt{t}}\right)+\frac{1}{2}erf\left(\frac{6-x}{2\sqrt{t}}\right)-\frac{1}{2}erf\left(\frac{6+x}{2\sqrt{t}}\right)$$

Received y e grass animated graph we draw :

> animate(plot,[u(t,x),x=0..15, y=-0.1..1.1], t=0.0000001..12, frames=60,thickness=3);



This one the solution animation to see Maple program for in the environment the following context Play from the menu choose need will be



Received y e grass and q 's one ny e chta mom e nti for graphics we draw :

```
> tau := 12:
u_1(x):=subs(t=tau*0.000001,u(t,x)):
u_2(x ):= subs(t=tau*(1/8),u( t,x )):
u_3(x ):= subs(t=tau*(2/8),u( t,x )):
…………………………………………………………
u_8(x):=subs(t=tau*(7/8),u(t,x)):
plot(u_1(x),x=0..15,y=-0.02..1.1,title="t = 0", color=red,thickness=3);
plot(u_2(x),x=0..15,y=-0.02..1.1,title="t = 1/8*tau",color=red,thickness=3);
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plot(u_8(x),x=0..15,y=-0.02..1.1,title="t = 7/8*tau",color=red,thickness=3);
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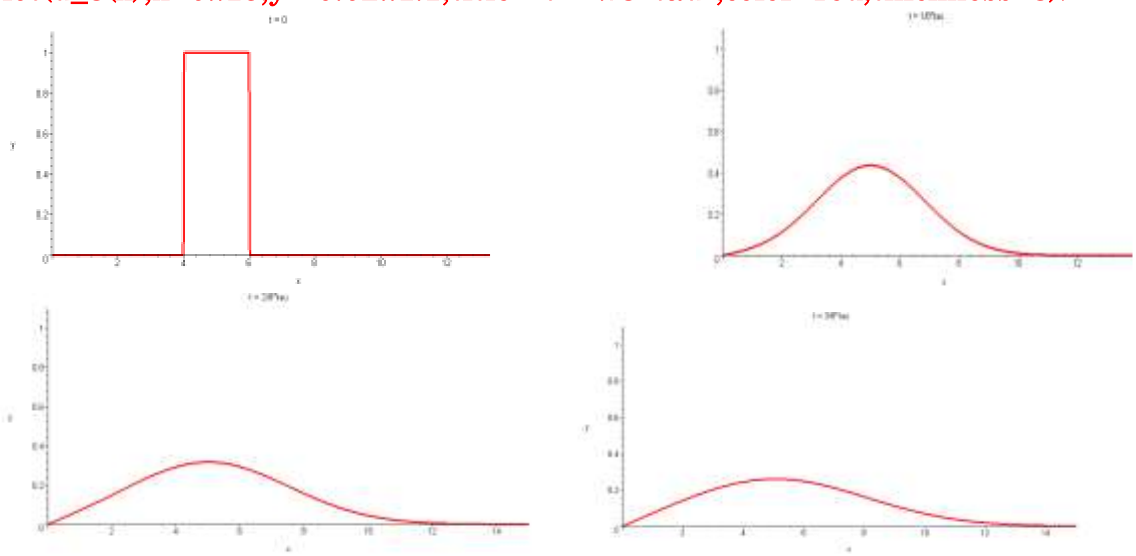

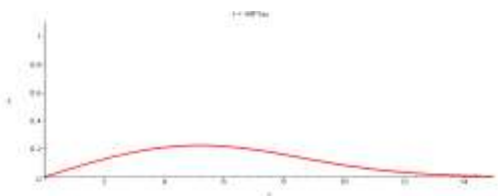

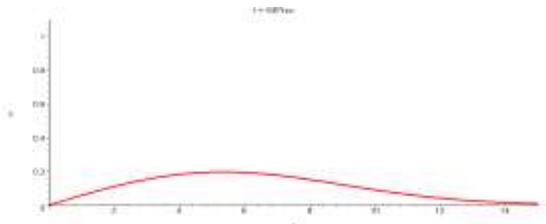

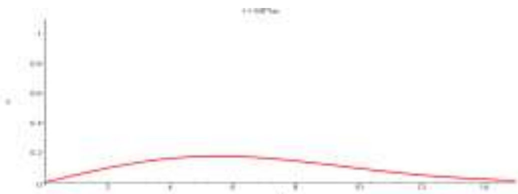

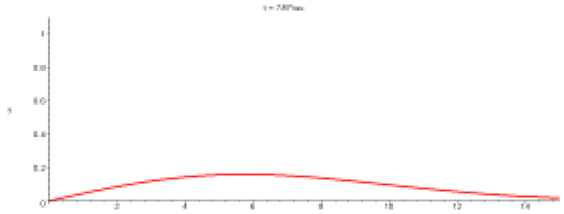

It can be seen that the process of solving the above-mentioned problem of heat dissipation by the method of separation of variables can be done completely through the Maple system. Received the solution the beginning conditional different $f(x)$ can be generated for functions. Maple system graph of possibilities using received solutions also generate graphs to do can _ Above algorithm to the issue of heat dissipation circle known one class issues solve enable will give and study in the process can be used . If it Mathematician physics equations science topics in teaching if used students for important the source is to students the subject more wider to understand enable gives , calculation experiment passing many examples solutions possible will be

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