```
> read "PDEParabCN.m":
```

Apl. příklad 4:

Nestacionární popis izotermního trubkového reaktoru s podélným promícháváním, v němž probíhá reakce A + A → 2 B tvaru

$$\frac{\partial}{\partial t}u = \frac{1}{Pe}\frac{\partial^2}{\partial x^2}u - \frac{\partial}{\partial x}u - Da\,u^2,$$

$$u(0,t) - \frac{1}{Pe}\frac{\partial}{\partial x}u(0,t) = p\ , \quad \frac{\partial}{\partial x}u(X,t) = 0, \quad u(x,0) = 0.$$

Volte parametry: Pe = 2, Da =1, p=0.07, X=48 $\frac{a}{b}$

řešeno pomocí metody Crank-Nicolsonové.

```
> Pe:=2:
  Da:=1:
  F:=x->0.0:
  p:=0.07;
  X:=48.0;
```

$$p := 0.07$$
$$X := 48.0 \qquad (1)$$

Definice pravé strany diferenciální rovnice

```
> g:=(x,t)->1/Pe;
  e:=(x,t)->-1;
  f:=(x,t,u)->-Da*u*u;
```

$$g := (x, t) \to \frac{1}{Pe}$$
$$e := (x, t) \to -1$$
$$f := (x, t, u) \to -Da\,u\,u \qquad (2)$$

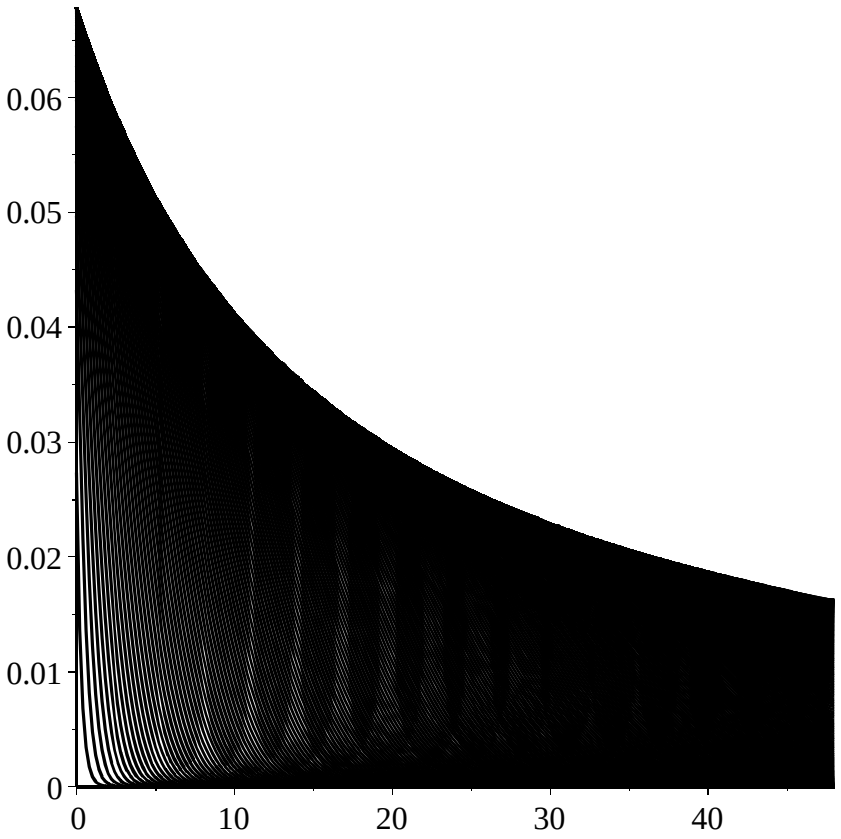
Parametry

```
> a:= 0.0;
  b:= 48.0:
  alfa1:= 1:
  alfa2:= 0:
  beta1:= t->-1/Pe:
  beta2:= t->1:
  gama1:= t->p:
  gama2:= t->0:

> n := 240;
  h := (b-a)/n;

> m := 300;
> k := 0.2;
  T := k*m;
> vysCN:=PDEParabCN(n,m,k,a,b, g,e,f,alfa1,beta1,alfa2,beta2,
  gama1,gama2,0):
```

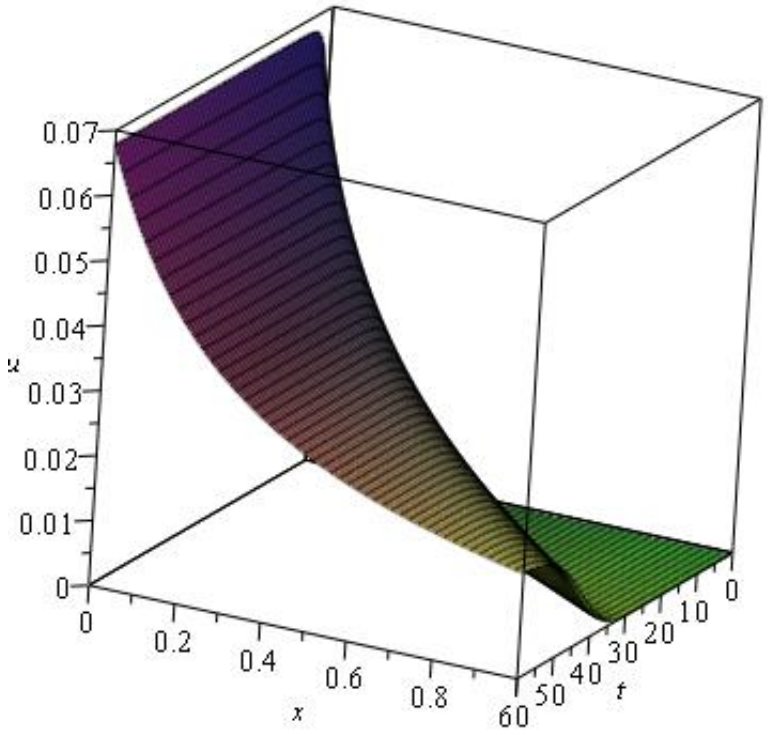
$$a := 0.$$
$$n := 240$$
$$h := 0.2000000000$$
$$m := 300$$
$$k := 0.2$$
$$T := 60.0 \qquad (3)$$

```
> data := [seq( [seq( [0 + (i-1) * h, vysCN[ j, i ]], i = 1 .. n + 1 ) ], j = 1 .. m + 1 ) ] :
```

```
> with( plots ) :
  display(seq(listplot(data[i]), i = 1 ..m) );
```




```
> a := subs(1 .. m + 1 = 0 ..T, 1 .. n + 1 = 0 .. 1, matrixplot(vysCN[1 .. m + 1, 1 .. n + 1],
       labels = [t, x, u]) ) :
  display(a, view = [0.0 .. T, 0 .. 1, 0 .. 0.07]);
```


0.07
0.06
0.05
0.04
u
0.03
0.02
0.01
0
0
0.2
0.4
0.6
0.8
x
60
50
40
30
20
10
0
t