```
> read "DESite.m":
```

Aplikaţní pŚíklad 2:

Axiální sdílení hmoty v trubkovém homogenním reaktoru, která je doprovázena reakcí 2. Śádu, je popsáno rovnicí

$$\frac{1}{Pe}\frac{d^2}{dx^2}u - \frac{d}{dx}u - R\,u^2 = 0$$

$$u(0) - \frac{1}{Pe}\frac{d}{dx}u(0) = 1, \quad \frac{d}{dx}u(1) = 0$$

Pouġijte parametry Pe = 6, R = 2

ř eġení

Definice parametrŢ diferenciální rovnice

```
> Pe:=6:
  R:=2:
```

Definice pravé strany diferenciální rovnice

```
> f:=(x,y,dy)-> Pe*dy+Pe*R*y^2 ;
```

$$f := (x, y, dy) \rightarrow Pe\,dy + Pe\,R\,y^2 \qquad \textbf{(1.1)}$$

Definice parametrŢ metody

```
> a := 0:
  b := 1:
  alfa1 := 1:
  alfa2 := 0:
  beta1 := -(1)/Pe:
  beta2 := 1:
  gama1 := 1:
  gama2 := 0:
  eps := 0.1e-5:
  n := 20:
  y0:=evalf([seq(0.5,i=1..n+1)]);
  y0[1]:=1.0;
  y0[n+1]:=1.0;
```

$y0 := [0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5]$

$$y0_1 := 1.0$$

$$y0_{21} := 1.0 \qquad \textbf{(1.2)}$$

```
> yres := DESite2(n,f,a, b,alfa1,alfa2,beta1,beta2,gama1,
  gama2, eps, y0, 10):
```

"iterace = ", 0

"y = ", [0.5833333331, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5000000000]

"iterace = ", 1, " s = ", 0.2760834191

"y = ", [0.8438195277, 0.7986826995, 0.7569804981, 0.7184533021, 0.6828619181, 0.6499863486, 0.6196248022, 0.5915929970, 0.5657238371, 0.5418675796, 0.5198926752, 0.4996875460, 0.4811636965, 0.4642607363, 0.4489541692, 0.4352671960, 0.4232883688, 0.4131977802, 0.4053057289, 0.4001096265, 0.3983775923]

"iterace = ", 2, " s = ", 0.02178039881

"y = ", [0.8321672163, 0.7842016125, 0.7410044708, 0.7019318338, 0.6664489250, 0.6341091581, 0.6045380265, 0.5774207990, 0.5524932768, 0.5295351152, 0.5083654379, 0.4888406697, 0.4708547202, 0.4543418905, 0.4392831741, 0.4257170111, 0.4137561000, 0.4036126290, 0.3956353898, 0.3903638490, 0.3886066686]

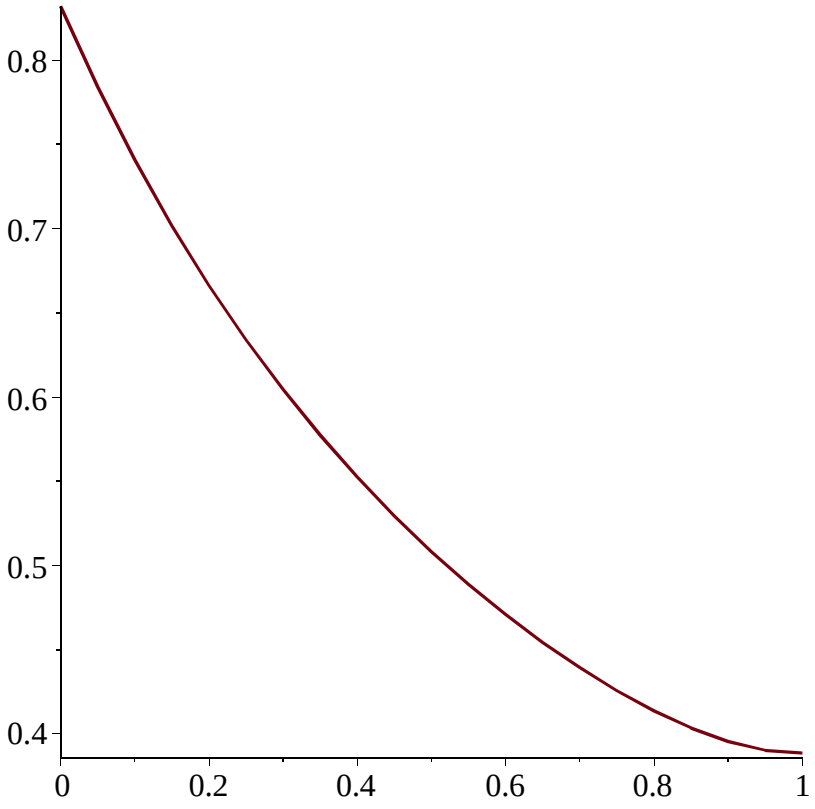
"iterace = ", 3, " s = ", 0.0001791264952

"y = ", [0.8321255837, 0.7841474884, 0.7409378517, 0.7018538342, 0.6663612979, 0.6340138914, 0.6044370566, 0.5773158382, 0.5523857274, 0.5294260478, 0.5082556078, 0.4887305568, 0.4707445777, 0.4542317981, 0.4391730910, 0.4256068280, 0.4136456897, 0.4035018936, 0.3955243023, 0.3902524834, 0.3884952106]

"iterace = ", 4, " s = ", $1.067421451\ 10^{-8}$

"y = ", [0.8321255830, 0.7841474881, 0.7409378519, 0.7018538341, 0.6663612969, 0.6340138895, 0.6044370542, 0.5773158352, 0.5523857234, 0.5294260425, 0.5082556017, 0.4887305503, 0.4707445707, 0.4542317907, 0.4391730831, 0.4256068199, 0.4136456813, 0.4035018850, 0.3955242937, 0.3902524748, 0.3884952016] **(1.3)**

```
> # Graf funkce yres(x)
> plot(yres);
```



```
> # Tabulka hodnot funkce y(x)
> linalg[matrix](yres);
```

$$\begin{bmatrix} 0. & 0.8321255830 \\ 0.05000000000 & 0.7841474881 \\ 0.1000000000 & 0.7409378519 \\ 0.1500000000 & 0.7018538341 \\ 0.2000000000 & 0.6663612969 \\ 0.2500000000 & 0.6340138895 \\ 0.3000000000 & 0.6044370542 \\ 0.3500000000 & 0.5773158352 \\ 0.4000000000 & 0.5523857234 \\ 0.4500000000 & 0.5294260425 \\ 0.5000000000 & 0.5082556017 \\ 0.5500000000 & 0.4887305503 \\ 0.6000000000 & 0.4707445707 \\ 0.6500000000 & 0.4542317907 \\ 0.7000000000 & 0.4391730831 \\ 0.7500000000 & 0.4256068199 \\ 0.8000000000 & 0.4136456813 \\ 0.8500000000 & 0.4035018850 \\ 0.9000000000 & 0.3955242937 \\ 0.9500000000 & 0.3902524748 \\ 1.000000000 & 0.3884952016 \end{bmatrix} \quad (1.4)$$