```
Get[FileNameJoin[{NotebookDirectory[], "DeSite.wl"}]]
```

Aplikační příklad 3

Apl. příklad 3: Axiální sdílení hmoty a tepla v trubkovém reaktoru lze na základě difuzního modelu popsat soustavou dvou nelineárních diferenciálních rovnic, které po kombinaci a převedení do bezrozměrného tvaru poskytnou rovnici

$$\frac{1}{\mathrm{Pe}}\frac{\partial^2 y}{\partial x^2} - \frac{\partial y}{\partial x} - p\, y^m\, T^{-m} e^{\left(K-\frac{R}{T}\right)} = 0, \text{ kde } T = 1\text{-}H(1\text{-}y)$$

$$y(0) = 1 + \frac{1}{\mathrm{Pe}}\frac{\partial y}{\partial x}(0), \quad \frac{\partial y}{\partial x}(1) = 0.$$

Použijte parametry Pe=10, p=0.6, K=14.1, R=10.85, m=1.0, H=0.1437

Definice parametrů diferenciální rovnice

```
Pe = 10;
p = 0.6;
K = 14.1;
R = 10.85;
m = 1.0;
H = 0.1437
```

```
0.1437
```

Definice pravé strany diferenciální rovnice

```
f[x_, y1_, y2_] = Pe * y2 + Pe * p * y1^m * (1 - H * (1 - y1)) ^ (-m) * Exp[K - R / (1 - H * (1 - y1))];
```

Parametry programu DESite2

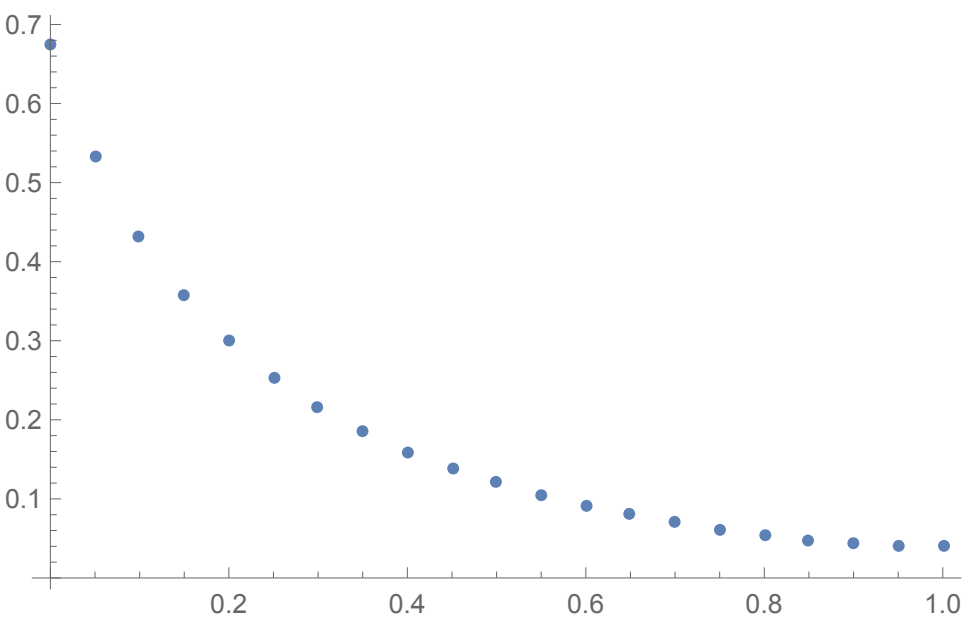
```
a = 0.0;
b = 1.0;
α1 = 1;
α2 = 0;
β1 = -1 / Pe;
β2 = 1;
γ1 = 1;
γ2 = 0;
ϵ = 0.000001;
n = 20;
y0 = Table[0.5, {i, 1, n + 1}];
y0[[1]] = 1.0;
y0[[n + 1]] = 1.0;
```

```
yres = DESite2[n, f, a, b, α1, α2 , β1, β2 , γ1 , γ2 , ϵ, y0, 10];
```

```
iterace =  0
y={0.625, 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}
iterace = 1     s = 0.458946
y={0.677275, 0.53756, 0.44114, 0.374599, 0.328677, 0.296986,
  0.275115, 0.260021, 0.249605, 0.242416, 0.237455, 0.234031, 0.231669,
  0.230038, 0.228913, 0.228138, 0.227604, 0.227239, 0.226996, 0.22685, 0.226802}
iterace = 2     s = 0.328995
y={0.675598, 0.53387, 0.433088, 0.357994, 0.300253, 0.254904,
  0.218784, 0.189754, 0.166294, 0.147276, 0.131835, 0.119294, 0.10911, 0.100849,
  0.0941582, 0.0887569, 0.0844271, 0.0810146, 0.0784432, 0.0767534, 0.0761901}
iterace = 3     s = 0.073443
y={0.675558, 0.533771, 0.43285, 0.357467, 0.299198, 0.253001,
  0.215659, 0.185014, 0.159563, 0.13822, 0.120185, 0.104851, 0.0917513, 0.0805249,
  0.0708903, 0.0626355, 0.0556167, 0.0497714, 0.0451555, 0.0420218, 0.0409772}
iterace = 4     s = 0.00212733
y={0.675558, 0.53377, 0.432849, 0.357465, 0.299194, 0.252993,
  0.215642, 0.184984, 0.15951, 0.138135, 0.120053, 0.104655, 0.0914742, 0.0801472,
  0.0703933, 0.0620033, 0.0548384, 0.0488449, 0.044093, 0.0408578, 0.0397793}
iterace = 5     s = 1.57468×10^-6
y={0.675558, 0.53377, 0.432849, 0.357465, 0.299194, 0.252993,
  0.215642, 0.184984, 0.15951, 0.138135, 0.120053, 0.104655, 0.0914741, 0.080147,
  0.0703931, 0.062003, 0.0548379, 0.0488443, 0.0440922, 0.0408568, 0.0397783}
iterace = 6     s = 8.17686×10^-13
y={0.675558, 0.53377, 0.432849, 0.357465, 0.299194, 0.252993,
  0.215642, 0.184984, 0.15951, 0.138135, 0.120053, 0.104655, 0.0914741, 0.080147,
  0.0703931, 0.062003, 0.0548379, 0.0488443, 0.0440922, 0.0408568, 0.0397783}
```

Graf řešení *y*(x)

```
ListPlot[yres]
```



Tabulka řešení *y*(x)

```
MatrixForm[yres]
```

0.	0.675558
0.05	0.53377
0.1	0.432849
0.15	0.357465
0.2	0.299194
0.25	0.252993
0.3	0.215642
0.35	0.184984
0.4	0.15951
0.45	0.138135
0.5	0.120053
0.55	0.104655
0.6	0.0914741
0.65	0.080147
0.7	0.0703931
0.75	0.062003
0.8	0.0548379
0.85	0.0488443
0.9	0.0440922
0.95	0.0408568
1.	0.0397783