```
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```

Aplikační příklad 4

Apl. příklad 4: Mějme rovnici popisující neizotermní vnitřní difuzi v částici katalyzátoru tvaru desky

$\frac{\partial^2 y}{\partial x^2} = \phi^2 \, y \, e^{\left(\frac{\alpha\beta(1-y)}{1+\beta(1-y)}\right)}$,

$\frac{\partial y}{\partial x}(0) = 0, \; y(1) = 1.$

Použijte parametry α=20, β=0.1, ϕ=1.

Definice parametrů diferenciální rovnice

```
α = 20;
β = 0.1;
ϕ = 1;
```

Definice pravé strany diferenciální rovnice

```
f[x_, y1_, y2_] = ϕ^2 y1 Exp[(α β (1 - y1)) / (1 + β (1 - y1))];
```

Parametry programu

```
a = 0.0;
b = 1.0;
α1 = 0;
α2 = 1;
β1 = 1;
β2 = 0;
γ1 = 0;
γ2 = 1;
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={0.5, 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, 1.}
```

```
iterace = 1     s = 0.346106
```

```
y={0.356569, 0.358146, 0.362878, 0.370767, 0.381817, 0.396037,
  0.413434, 0.434018, 0.457802, 0.484801, 0.515031, 0.548509, 0.585257,
  0.625295, 0.66865, 0.715345, 0.76541, 0.818875, 0.875772, 0.936134, 1.}
```

```
iterace = 2     s = 0.0221961
```

```
y={0.374136, 0.375659, 0.380226, 0.387852, 0.398553, 0.412356,
  0.42929, 0.449386, 0.472674, 0.499182, 0.528931, 0.561933, 0.598188,
  0.637682, 0.680384, 0.726248, 0.775205, 0.827171, 0.882042, 0.939697, 1.}
```

```
iterace = 3     s = 0.000369655
```

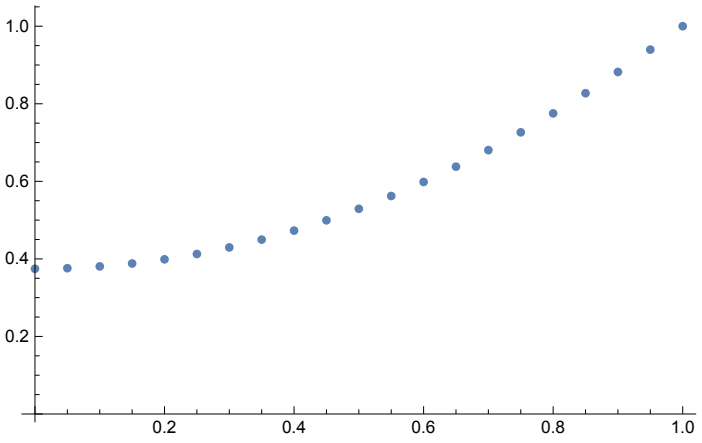
```
y={0.374465, 0.375986, 0.38055, 0.38817, 0.398863, 0.412657,
  0.429579, 0.449661, 0.472934, 0.499426, 0.529157, 0.562139, 0.598374,
  0.637846, 0.680527, 0.726367, 0.775301, 0.827244, 0.88209, 0.939721, 1.}
```

```
iterace = 4     s = 1.15361×10^-7
```

```
y={0.374465, 0.375986, 0.380551, 0.38817, 0.398864, 0.412657,
  0.429579, 0.449661, 0.472934, 0.499426, 0.529157, 0.562139, 0.598374,
  0.637846, 0.680527, 0.726367, 0.775301, 0.827244, 0.88209, 0.939721, 1.}
```

Graf řešení *y*(x)

```
ListPlot[yres]
```



Tabulka řešení *y*(x)

```
MatrixForm[yres]
```

0.	0.374465
0.05	0.375986
0.1	0.380551
0.15	0.38817
0.2	0.398864
0.25	0.412657
0.3	0.429579
0.35	0.449661
0.4	0.472934
0.45	0.499426
0.5	0.529157
0.55	0.562139
0.6	0.598374
0.65	0.637846
0.7	0.680527
0.75	0.726367
0.8	0.775301
0.85	0.827244
0.9	0.88209
0.95	0.939721
1.	1.