

数値計算・講義資料

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$\sqrt{2}$ を Newton 法により求める.

$$f(x) = x^2 - 2, \quad f'(x) = 2x$$

に Newton 法を適用する. 下記に結果を記す.

```
x0 = 2.00000 00000 00000
x1 = 1.50000 00000 00000
x2 = 1.41666 66666 66667
x3 = 1.41421 56862 74510
x4 = 1.41421 35623 74690
x5 = 1.41421 35623 73095

solution (exact)           : 1.41421 35623 73095
solution (Newton method)  : 1.41421 35623 73095
```

方程式 $x^2 - 6x + 9 = (x - 3)^2 = 0$ の根 $x = 3$ (二重根) を Newton 法により求めた. 下記に結果を記す. 重根なので収束が遅い.

```
x( 0) = 4.000000000000000e+000
x( 1) = 3.500000000000000e+000
x( 2) = 3.250000000000000e+000
x( 3) = 3.125000000000000e+000
x( 4) = 3.062500000000000e+000
x( 5) = 3.031250000000000e+000
x( 6) = 3.015625000000000e+000
x( 7) = 3.007812500000000e+000
x( 8) = 3.003906250000000e+000
x( 9) = 3.001953125000000e+000
x(10) = 3.000976562500000e+000
x(11) = 3.000488281250000e+000
x(12) = 3.000244140625000e+000
x(13) = 3.000122070312500e+000
x(14) = 3.000061035156250e+000
x(15) = 3.000030517578125e+000
x(16) = 3.000015258789063e+000
x(17) = 3.000007629394531e+000
x(18) = 3.000003814697266e+000
x(19) = 3.000001907348633e+000
x(20) = 3.000000953674316e+000
x(21) = 3.000000476837158e+000
```

```
x( 22) = 3.000000238418579e+000
x( 23) = 3.000000119209290e+000
x( 24) = 3.000000059604645e+000
x( 25) = 3.000000029802322e+000
solution (exact)      : 3.000000000000000e+000
solution (Newton method) : 3.000000029802322e+000
```