計算数学 第 1 回 演習問題

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4 月 14 日修正

17 行目の (a + b) を (b - a) に修正．なお，第 1 回授業スライド 14 ページのアルゴリズムでこの点が誤っている．

Nim によるプログラム

```
1  import strformat
2
3  proc midPointInt(a, b: float64, n: int, f: proc(x: float64): float64): float64 =
4    result = 0.0
5    for k in 0 ..< int(n):
6      result += f(a + (k.toFloat + 0.5) * (b - a) / n.toFloat)
7    result *= (b - a) / n.toFloat
8
9  func f(x: float64): float64 =
10   return 1 / x
11
12 const
13   a = 1.0
14   b = 2.0
15 var
16   N = 1
17   T = (b - a) * (f(a) + f(b)) / 2.0
18   M = midPointInt(a, b, N, f)
19   S = (T + 2.0 * M) / 3.0
20 echo fmt"N = {N:4}    M = {M:16.14f}   T = {T:16.14f}    S = {S:16.14f}"
21 for m in 1..10:
22   T = (T + M) / 2.0
23   N *= 2
24   M = midPointInt(a, b, N, f)
```

```
25      S = (T + 2.0 * M) / 3.0
26      echo fmt"N = {N:4}    M = {M:16.14f}   T = {T:16.14f}    S = {S:16.14f}"
```

出力結果

```
N =    1    M = 0.66666666666667   T = 0.75000000000000    S = 0.69444444444444
N =    2    M = 0.68571428571429   T = 0.70833333333333    S = 0.69325396825397
N =    4    M = 0.69121989121989   T = 0.69702380952381    S = 0.69315453065453
N =    8    M = 0.69266055404320   T = 0.69412185037185    S = 0.69314765281942
N =   16    M = 0.69302521433097   T = 0.69339120220753    S = 0.69314721028982
N =   32    M = 0.69311666949756   T = 0.69320820826925    S = 0.69314718242146
N =   64    M = 0.69313955157281   T = 0.69316243888340    S = 0.69314718067634
N =  128    M = 0.69314527323678   T = 0.69315099522811    S = 0.69314718056722
N =  256    M = 0.69314670372438   T = 0.69314813423244    S = 0.69314718056040
N =  512    M = 0.69314706135075   T = 0.69314741897841    S = 0.69314718055997
```