

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 = 0.666666666666667	T = 2.250000000000000	S = 1.194444444444444
N =	2	M = 0.68571428571429	T = 1.458333333333333	S = 0.94325396825397
N =	4	M = 0.69121989121989	T = 1.07202380952381	S = 0.81815453065453
N =	8	M = 0.69266055404320	T = 0.88162185037185	S = 0.75564765281942
N =	16	M = 0.69302521433097	T = 0.78714120220753	S = 0.72439721028982
N =	32	M = 0.69311666949756	T = 0.74008320826925	S = 0.70877218242146
N =	64	M = 0.69313955157281	T = 0.71659993888340	S = 0.70095968067634
N =	128	M = 0.69314527323678	T = 0.70486974522811	S = 0.69705343056722
N =	256	M = 0.69314670372438	T = 0.69900750923244	S = 0.69510030556040
N =	512	M = 0.69314706135075	T = 0.69607710647841	S = 0.69412374305997
N =	1024	M = 0.69314715075763	T = 0.69461208391458	S = 0.69363546180995