# 計算数学 第 1 回 演習問題

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## Nim によるプログラム

```nim
import strformat

proc midPointInt(a, b: float64, n: int, f: proc(x: float64): float64): float64 =
  result = 0.0
  for k in 0 ..< int(n):
    result += f(a + (k.toFloat + 0.5) * (b - a) / n.toFloat)
  result *= (b - a) / n.toFloat

func f(x: float64): float64 =
  return 1 / x

const
  a = 1.0
  b = 2.0
var
  N = 1
  T = (a + b) * (f(a) + f(b)) / 2.0
  M = midPointInt(a, b, N, f)
  S = (T + 2.0 * M) / 3.0
echo fmt"N = {N:4}    M = {M:16.14f}   T = {T:16.14f}    S = {S:16.14f}"
for m in 1..10:
  T = (T + M) / 2.0
  N *= 2
  M = midPointInt(a, b, N, f)
  S = (T + 2.0 * M) / 3.0
  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 = 2.25000000000000    S = 1.19444444444444
N =    2    M = 0.68571428571429    T = 1.45833333333333    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
```