6.5. Program for Simpson's Rule

$\Delta x = \frac{B-A}{N}$, $x_i = A + (i-1)\Delta x$ $\quad x_{i+0.5} = x_i + \frac{\Delta x}{2}$ $\quad x_{i+1} = x_i + \Delta x$

$$\text{area} \approx \sum_{i=1}^{N} \frac{1}{6}\left[f(x_i) + 4f(x_{i+0.5}) + f(x_{i+1}) \right] \Delta x$$

prgm SR (Simpson's Rule)

```
: ClrHome
: Disp "FROM:"
: Prompt A
: Disp "TO:"
: Prompt B
: Disp "NUMBER"
: Disp "SUBDIVISIONS:"
: Prompt N
: (B-A)/N → C              ΔX ≡ C
: ϕ → S
: For (I, 1, N, 1)
:  A + (I-1) * C → D       x_i ≡ D
:  D + 0.5 * C → E         x_{i+0.5} ≡ E
:  D + C → F               x_{i+1} ≡ F
:  S + (Y1(D) + 4 * Y1(E) + Y1(F)) * C / 6 → S
: End
: Disp S
```

Example. For $\int_0^{\pi/4} \sec^2 x \, dx$ the program gives

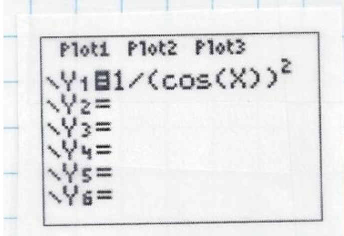
N	area
2	1.000 548 895
10	1.000 001 048
50	1.000 000 002

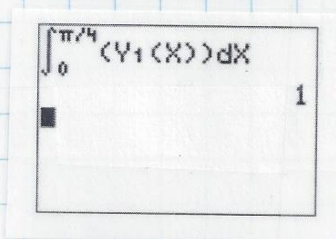
The exact value is $\int_0^{\pi/4} \sec^2 x \, dx = \left[\tan x \right]_0^{\pi/4} = 1 - 0 = 1$ ◄

6.5. Program for Simpson's Rule

MATH fnInt(uses Simpson's Rule with an algorithm which decides the optimal number of subdivisions.

Using fnInt to calculate $\int_0^{\pi/4} \sec^2 x\,dx$ gives





CLASS WORK

Use prgmSR to estimate $\int_0^{\pi/2} \sin x\,dx$ for 2, 10, 40 and 50 subdivisions.

SOLUTION

N	area
2	1.000 134 585
10	1.000 000 212
40	1.000 000 001
50	1