Welcome to DrRacket, version 8.13 [cs].
Language: reader "../Scheme-PLUS-for-Racket/main/Scheme-PLUS-for-Racket/src/SRFI-105.rkt", with debugging; memory limit: 8192 MB.

```
SRFI-105 Curly Infix parser with optimization by Damien
MATTEI
(based on code from David A. Wheeler and Alan Manuel K.
Gloria.)

Options :

Infix optimizer is ON.
Infix optimizer on sliced containers is ON.

Possibly skipping some header's lines containing
space,tabs,new line,etc  or comments.

SRFI-105.rkt : number of skipped lines (comments, spaces,
directives,...) at header's beginning : 22

Parsed curly infix code result =

(module exo_retropropagationNhidden_layers_matrix_v2 racket
  (provide (all-defined-out))
  (require plot)
  (require (rename-in srfi/42 (: s42:)))
  (require (rename-in
            flomat
            (repeat repeat-flomat)
            (shape shape-flomat)
            (transpose transpose-flomat)))
  (require "matrix+.rkt")
  (require
"../Scheme-PLUS-for-Racket/main/Scheme-PLUS-for-Racket/src/
Scheme+.rkt")
  (define-overload-existing-operator +)
  (define-overload-procedure uniform)
  (overload-existing-operator + vector-append (vector?
vector?))
  (define (uniform-dummy dummy) (* (random) (if (= (random
2) 0) 1 -1)))
  (define (uniform-interval inf sup)
    (<- gap (- sup inf))
```

```
    (+ inf (* gap (random))))
  (overload-procedure uniform uniform-dummy (number?))
  (overload-procedure uniform uniform-interval (number?
number?))
  (define (σ ž) (/ 1 (+ 1 (exp (- ž)))))
  (define (der_tanh z ž) (- 1 (** z 2)))
  (define (der_σ z ž) (* z (- 1 z)))
  (define (der_atan z ž) (/ 1 (+ 1 (** ž 2))))
  (define ReseauRetroPropagation
    (class object%
      (super-new)
      (init-field
       (nc #(2 3 1))
       (nbiter 10000)
       (η 1.0)
       (activation_function_hidden_layer tanh)
       (activation_function_output_layer tanh)
       (activation_function_hidden_layer_derivative
der_tanh)
       (activation_function_output_layer_derivative
der_tanh))
      (<- lnc (vector-length nc))
      (field (z (vector-ec (:vector lg nc) (make-vector lg
0))))
      (display "z=")
      (display z)
      (newline)
      (field (ž (vector-ec (:vector lg nc) (make-vector lg
0))))
      (display "ž=")
      (display ž)
      (newline)
      (define-pointwise-unary uniform)
      (field
       (M
        (vector-ec
         (s42: n (- lnc 1))
         (.uniform!
          (zeros
           ($bracket-apply$next nc (+ n 1))
           (+ ($bracket-apply$next nc n) 1))))))
      (display "M=")
```

```
      (display M)
      (newline)
      (<- ∇ (for/vector ((lg nc)) (make-vector lg 0)))
      (display "∇=")
      (display ∇)
      (newline)
      (display "nbiter=")
      (display nbiter)
      (newline)
      (field (error 0))
      (define
       (accepte_et_propage x)
       (when (≠ (vector-length x) (vector-length
($bracket-apply$next z 0)))
         (display "Mauvais nombre d'entrées !")
         (newline)
         (exit #f))
       (<- ($bracket-apply$next z 0) x)
       (<- n (vector-length z))
       (declare z_1)
       (declare i)
       (for
        ((<- i 0) (< i (- n 2)) (<- i (+ i 1)))
        (<- z_1 (+ #(1) ($bracket-apply$next z i)))
        (<- ($bracket-apply$next ž (+ i 1)) (*
($bracket-apply$next M i) z_1))
        (<-
         ($bracket-apply$next z (+ i 1))
         (vector-map
          activation_function_hidden_layer
          ($bracket-apply$next ž (+ i 1)))))
       (<- z_1 (+ #(1) ($bracket-apply$next z i)))
       (<- ($bracket-apply$next ž (+ i 1)) (*
($bracket-apply$next M i) z_1))
       (<-
        ($bracket-apply$next z (+ i 1))
        (vector-map
         activation_function_output_layer
         ($bracket-apply$next ž (+ i 1)))))
      (define/public
       (apprentissage Lexemples)
       (<- ip 0)
```

```
       (declare x y)
       (for-racket
        ((it (in-range nbiter)))
        (when (= (% it 1000) 0) (display it) (newline))
        (<- err 0.0)
        (<- x (car ($bracket-apply$next Lexemples ip)))
        (<- y (cdr ($bracket-apply$next Lexemples ip)))
        (accepte_et_propage x)
        (<- i i_output_layer (- (vector-length z) 1))
        (<- ns (vector-length ($bracket-apply$next z i)))
        (for-racket
         ((k (in-range ns)))
         (<-
          ($bracket-apply$next ($bracket-apply$next ∇ i) k)
          (-
           ($bracket-apply$next y k)
           ($bracket-apply$next ($bracket-apply$next z i)
k)))
         (<-
          err
          (+ err (** ($bracket-apply$next
($bracket-apply$next ∇ i) k) 2))))
        (<- err (* err 0.5))
        (when (= it (- nbiter 1)) (<- error err))
        (<- ∂z꘲∂ž
activation_function_output_layer_derivative)
        (modification_des_poids
         ($bracket-apply$next M (- i 1))
         η꘹
         ($bracket-apply$next z (- i 1))
         ($bracket-apply$next z i)
         ($bracket-apply$next ž i)
         ($bracket-apply$next ∇ i)
         ∂z꘲∂ž)
        (<- ∂z꘲∂ž
activation_function_hidden_layer_derivative)
        (for-racket
         ((i (reversed (in-range 1 i_output_layer))))
         (<- nc (vector-length ($bracket-apply$next z i)))
         (<- ns (vector-length ($bracket-apply$next z (+ i
1))))
         (for-racket
```

```
          ((j (in-range nc)))
          (<-
           ($bracket-apply$next ($bracket-apply$next ∇ i)
j)
           (for/sum
            ((k (in-range ns)))
            (*
             (∂z²ᶜ꜀₆∂ž
              ($bracket-apply$next ($bracket-apply$next z
(+ i 1)) k)
              ($bracket-apply$next ($bracket-apply$next ž
(+ i 1)) k))
             ($bracket-apply$next ($bracket-apply$next M
i) k (+ j 1))
             ($bracket-apply$next ($bracket-apply$next ∇
(+ i 1)) k)))))
          (modification_des_poids
           ($bracket-apply$next M (- i 1))
           η²⁰₉ʙ
           ($bracket-apply$next z (- i 1))
           ($bracket-apply$next z i)
           ($bracket-apply$next ž i)
           ($bracket-apply$next ∇ i)
           ∂z²ᶜ꜀₆∂ž))
         (<- ip (random (vector-length Lexemples)))))
      (define
       (modification_des_poids M_i_o η z_input z_output
ž_output ∇_i_o ∂z²ᶜ꜀₆∂ž)
       (<- (len_layer_output len_layer_input_plus1forBias)
(dim M_i_o))
       (<- len_layer_input (- len_layer_input_plus1forBias
1))
       (for-racket
        ((j (in-range len_layer_output)))
        (for-racket
         ((i (in-range len_layer_input)))
         (<-
          ($bracket-apply$next M_i_o j (+ i 1))
          (-
           ($bracket-apply$next M_i_o j (+ i 1))
           (*
            (- η)
```

```
      ($bracket-apply$next z_input i)
      (∂z²ᶜ₆∂ž
       ($bracket-apply$next z_output j)
       ($bracket-apply$next ž_output j))
      ($bracket-apply$next ∇_i_o j)))))
  (<-
   ($bracket-apply$next M_i_o j 0)
   (-
    ($bracket-apply$next M_i_o j 0)
    (*
     (- η)
     1.0
     (∂z²ᶜ₆∂ž
      ($bracket-apply$next z_output j)
      ($bracket-apply$next ž_output j))
     ($bracket-apply$next ∇_i_o j))))))
(define/public
 (test Lexemples)
 (display "Test des exemples :")
 (newline)
 (<- err 0)
 (declare entree sortie_attendue ∇)
 (for-racket
  ((entree-sortie_attendue Lexemples))
  (<- entree (car entree-sortie_attendue))
  (<- sortie_attendue (cdr entree-sortie_attendue))
  (accepte_et_propage entree)
  (printf
   "~a --> ~a : on attendait ~a"
   entree
   ($bracket-apply$next z (- (vector-length z) 1))
   sortie_attendue)
  (newline)
  (<-
   ∇
   (-
    ($bracket-apply$next sortie_attendue 0)
    ($bracket-apply$next
     ($bracket-apply$next z (- (vector-length z) 1))
     0)))
  (<- error (+ error (** ∇ 2))))
```

```
       (<- err (* err 0.5))
       (display "Error on examples=")
       (display error)
       (newline))
      (define/public
       (DL-data-2D)
       (list-ec
        (s42: n 100)
        ($+>
         (<- xp (+ (/ (- pi) 2) (* pi (/ n 100))))
         (accepte_et_propage (vector xp))
         (<-
          xp-DL
          ($bracket-apply$next
           ($bracket-apply$next z (- (vector-length z) 1))
           0))
         (vector xp xp-DL))))
      (define/public
       (DL-plot)
       (<- Lplot-DL (DL-data-2D))
       (plot (points Lplot-DL #:sym 'fullcircle1 #:color
"red")))))
  (printf "################### NOT ###################")
  (newline)
  (<-
   r1
   (new
    ReseauRetroPropagation
    (nc #(1 2 1))
    (nbiter 5000)
    (η 10)
    (activation_function_hidden_layer σ)
    (activation_function_output_layer σ)
    (activation_function_hidden_layer_derivative der_σ)
    (activation_function_output_layer_derivative der_σ)))
  (<- Lexemples1 #((#(1) . #(0)) (#(0) . #(1))))
  (send r1 apprentissage Lexemples1)
  (send r1 test Lexemples1)
  (<- precision 100.0)
  (display "precision=")
  (display precision)
  (newline)
```

```
  (define (trunc x) (/ (round (* precision x)) precision))
  (define-pointwise-unary trunc)
  (define (trunc-matrix mt) (.trunc! mt))
  (<- M (get-field M r1))
  (newline)
  (display "Matrix vector M=")
  (newline)
  (display M)
  (newline)
  (for-racket ((mt M)) (trunc-matrix mt))
  (display "Matrix vector modified M=")
  (newline)
  (display M)
  (newline)
  (send r1 test Lexemples1)
  (newline)
  (printf "################### XOR ###################")
  (newline)
  (<-
   r2
   (new
    ReseauRetroPropagation
    (nc #(2 3 1))
    (nbiter 250000)
    (η 10)
    (activation_function_hidden_layer σ)
    (activation_function_output_layer σ)
    (activation_function_hidden_layer_derivative der_σ)
    (activation_function_output_layer_derivative der_σ)))
  (<-
   Lexemples2
   #((#(1 0) . #(1)) (#(0 0) . #(0)) (#(0 1) . #(1)) (#(1
1) . #(0))))
  (send r2 apprentissage Lexemples2)
  (send r2 test Lexemples2)
  (<- M (get-field M r2))
  (newline)
  (display "Matrix vector M=")
  (newline)
  (display M)
  (newline)
  (for-racket ((mt M)) (trunc-matrix mt))
```

```
  (display "Matrix vector modified M=")
  (newline)
  (display M)
  (newline)
  (send r2 test Lexemples2)
  (newline)
  (printf "################### SINUS ###################")
  (newline)
  (<-
   r3
   (new
    ReseauRetroPropagation
    (nc #(1 70 70 1))
    (nbiter 50000)
    (η 0.01)
    (activation_function_hidden_layer atan)
    (activation_function_output_layer tanh)
    (activation_function_hidden_layer_derivative der_atan)
    (activation_function_output_layer_derivative
der_tanh)))
  (<-
   Llearning
   (vector-ec
    (:list x (list-ec (s42: n 10000) (uniform (- pi) pi)))
    (cons (vector x) (vector (sin x)))))
  (<-
   Ltest
   (vector-ec
    (:list x (list-ec (s42: n 10) (uniform (/ (- pi) 2) (/
pi 2))))
    (cons (vector x) (vector (sin x)))))
  (<-
   Lplot-sin
   (list-ec
    (s42: n 100)
    ($+> (<- xp (+ (/ (- pi) 2) (* pi (/ n 100)))) (vector
xp (sin xp)))))
  (display "Lplot-sin =")
  (newline)
  (display Lplot-sin)
  (newline)
  (plot
```

```
   (points Lplot-sin #:sym 'fullcircle1 #:color "blue"
#:label "y = sin(x)"))
  (send r3 apprentissage Llearning)
  (send r3 test Ltest)
  (send r3 DL-plot)
  (<- Lplot-DL-main (send r3 DL-data-2D))
  (plot
   (list
    (points Lplot-sin #:sym 'fullcircle1 #:color "blue"
#:label "y = sin(x)")
    (points Lplot-DL-main #:sym 'circle1 #:color "red"
#:label "neural sine")))
  (<- M (get-field M r3))
  (newline)
  (display "Matrix vector M=")
  (newline)
  (display M)
  (newline)
  (<- precision 1000.0)
  (display "precision=")
  (display precision)
  (newline)
  (define (trunc3 x) (/ (round (* precision x)) precision))
  (define-pointwise-unary trunc3)
  (define (trunc3-matrix mt) (.trunc3! mt))
  (for-racket ((mt M)) (trunc3-matrix mt))
  (display "Matrix vector modified M=")
  (newline)
  (display M)
  (newline)
  (send r3 test Ltest)
  (newline)
  (<- Lplot-DL-trunc (send r3 DL-data-2D))
  (plot
   (list
    (points
     Lplot-DL-trunc
     #:sym
     'circle1
     #:color
     "green"
     #:label
```

```
     "neural sine - matrices with truncated numbers")
    (points
     Lplot-DL-main
     #:sym
     'circle1
     #:color
     "red"
     #:label
     "neural sine"))))

################### NOT ###################
z=#(#(0) #(0 0) #(0))
ž=#(#(0) #(0 0) #(0))
M=#((flomat: ((0.6447519124737936 -0.3786303863756173 6)
(0.7417571261258522 0.9316090421692191))) (flomat:
((-0.28758622841395803 -0.0315167947103021
-0.11238479460031663))))
∇=#(#(0) #(0 0) #(0))
nbiter=5000
0
1000
2000
3000
4000
Test des exemples :
#(1) --> #(0.004587895867126144) : on attendait #(0)
#(0) --> #(0.9947643232569748) : on attendait #(1)
Error on examples=6.218308379232284e-5
precision=100.0

Matrix vector M=
#((flomat: ((1.8152910234817026 -3.1554263757650522)
(-3.0327762531886866 6.228674280658298))) (flomat:
((2.1746890148332936 4.039406836147639
-8.736057058144336))))
Matrix vector modified M=
#((flomat: ((1.82 -3.16) (-3.03 6.23))) (flomat: ((2.17
4.04 -8.74))))
Test des exemples :
#(1) --> #(0.004544191323881111) : on attendait #(0)
#(0) --> #(0.9947479494410946) : on attendait #(1)
Error on examples=0.0001104167936536580 3
```

```
################## XOR ##################
z=#(#(0 0) #(0 0 0) #(0))
ž=#(#(0 0) #(0 0 0) #(0))
M=#((flomat: ((0.4921374168164523 -0.42807507795272776
-0.21352478266068614) (-0.25840107275811564
0.2892869429596896 -0.5136386968281235)
(-0.7564756631261991 -0.4072549577590617
0.3812685288265008))) (flomat: ((-0.369136149012558
-0.6092928451795392 -0.4507292298953235
0.8905182760739238))))
∇=#(#(0 0) #(0 0 0) #(0))
nbiter=250000
0
1000
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3000
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6000
7000
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Test des exemples :
#(1 0) --> #(0.9982996037110752) : on attendait #(1)
#(0 0) --> #(0.0003641429931353 1826) : on attendait #(0)
#(0 1) --> #(0.9983048494490441) : on attendait #(1)
#(1 1) --> #(0.0021436949699986 68) : on attendait #(0)
Error on examples=1.1938845594195027e-5

Matrix vector M=
#((flomat: ((-0.46650473236101786 -3.42537392369584
8.777321143980888) (0.3094240945499729 9.35224466228428
-4.402127974981613) (-2.422287576212709 9.07129105561903
8.580628866023433))) (flomat: ((3.2002030916915065
-12.961918317770323 -12.929118559430576
16.383702415791838))))
Matrix vector modified M=
#((flomat: ((-0.47 -3.43 8.78) (0.31 9.35 -4.4) (-2.42
9.07 8.58))) (flomat: ((3.2 -12.96 -12.93 16.38))))
Test des exemples :
#(1 0) --> #(0.9982950713443539) : on attendait #(1)
#(0 0) --> #(0.0003683318135450472) : on attendait #(0)
#(0 1) --> #(0.9983006136610401) : on attendait #(1)
#(1 1) --> #(0.0021386043875128167) : on attendait #(0)
Error on examples=2.2442838295240325e-5

################### SINUS ###################
z=#(#(0) #(0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0) #(0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0) #(0))
```
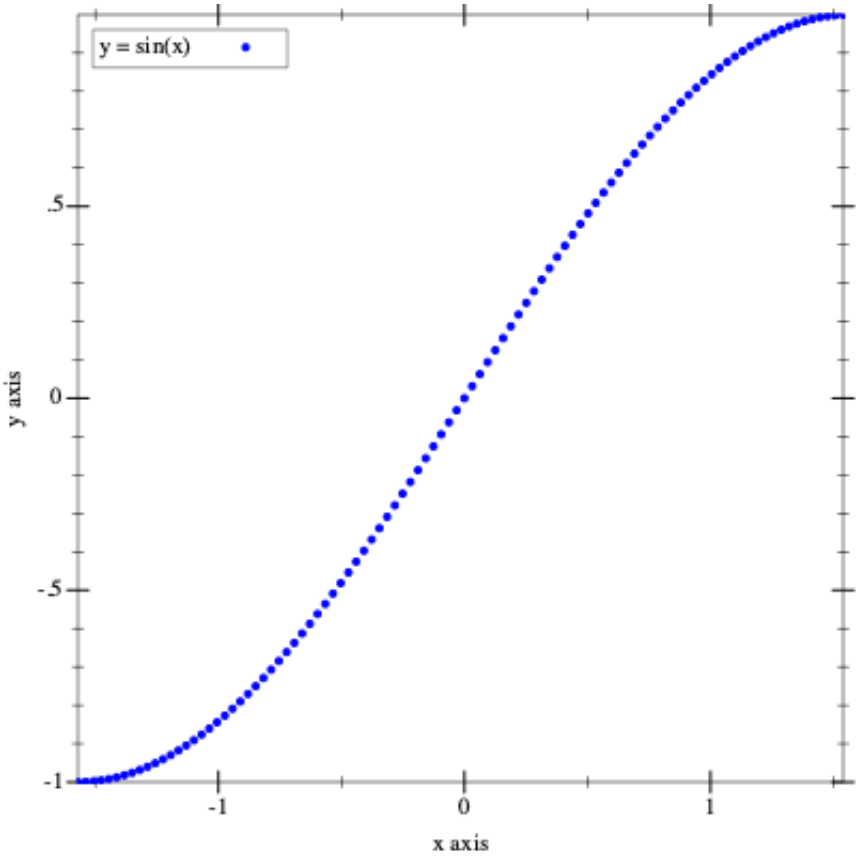

```
z̃=#(#(0) #(0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0) #(0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0) #(0))
M=#((flomat 70 2 ...) (flomat 70 71 ...) (flomat:
((-0.6802761916763727 -0.4343445115591536
-0.6620598758357704 0.5491575911233153
0.013107789616663998 0.12428473002538641
0.8151242315177434 0.9737410479081186 0.25088104190846366
-0.9128696545671878 -0.5586320716411507
-0.9093501565849486 0.28614271304516226
-0.20020562448603332 -0.04740871089999841
0.11385964036053169 0.087950010153838 -0.22027176311624394
-0.44224552577060405 0.32123357751792864
0.49946483408303133 0.805434004294284 0.9572263392859788
-0.36667783750896116 -0.7582132196306135
0.48744830870750555 0.477443069291338 0.19655593947592087
0.997420256832478 -0.49348361479225383 0.16883526256255216
-0.649191766053412 0.2493853273038166 -0.05173738365093614
-0.46473805295897536 -0.44718997902598134
-0.6705456922001913 -0.7951295635166926
-0.11392906696937186 0.8446318636842602 0.9760684303525449
0.389290780055449 -0.8572008978337485 -0.6389022597325198
-0.5819317698576042 -0.82954836416665 0.3252340666131782
-0.36304657755272657 0.3076102544979502
-0.2556291909820567 -0.7877106098094506
-0.6010812667722124 -0.36567924056697687
0.9455558284361877 0.38134638856166253 -0.350876045409175
-0.6311735066781029 0.2505886473512367 -0.6696135630550845
0.2361602711308134 0.4911660249723432 0.12558575885413165
0.8191048997393389 0.8184686611037426 -0.8514811876481603
-0.9830846021607512 -0.14689028252688674
0.4050332701874246 0.1658776121918446 0.16939672530501124
0.6670648818252365))))
∇=#(#(0) #(0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0) #(0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0) #(0))
```

```
nbiter=50000
Lplot-sin =
(#(-1.570796326794896 -1.0) #(-1.5393804002589986
-0.9995065603657316) #(-1.5079644737231006
-0.9980267284282716) #(-1.4765485471872029
-0.99556196460308) #(-1.4451326206513049
-0.9921147013144779) #(-1.413716694115407
-0.9876883405951378) #(-1.382300767579509
-0.9822872507286886) #(-1.350884841043611
-0.9759167619387473) #(-1.3194689145077132
-0.9685831611286311) #(-1.2880529879718152
-0.9602936856769431) #(-1.2566370614359172
-0.9510565162951535) #(-1.2252211349000193
-0.9408807689542255) #(-1.1938052083641213
-0.9297764858882513) #(-1.1623892818282235
-0.9177546256839811) #(-1.1309733552923253
-0.9048270524660195) #(-1.099557428756427 6
-0.8910065241883679) #(-1.0681415022205296
-0.8763066800438636) #(-1.0367255756846316
-0.8607420270039435) #(-1.0053096491487339
-0.8443279255020151) #(-0.9738937226128359
-0.8270805742745618) #(-0.9424777960769379
-0.8090169943749475) #(-0.9110618695410401
-0.7901550123756904) #(-0.8796459430051421
-0.7705132427757893) #(-0.8482300164692441
-0.7501110696304596) #(-0.8168140899333463
-0.7289686274214116) #(-0.7853981633974483
-0.7071067811865475) #(-0.7539822368615503
-0.6845471059286886) #(-0.7225663103256523
-0.6613118653236518) #(-0.6911503837897544
-0.6374239897486896) #(-0.6597344572538566
-0.6129070536529765) #(-0.6283185307179586
-0.5877852522924731) #(-0.5969026041820606
-0.5620833778521306) #(-0.5654866776461627
-0.5358267949789965) #(-0.5340707511102647
-0.5090414157503712) #(-0.5026548245743667
-0.4817536741017151) #(-0.4712388980384689 7
-0.4539904997395468) #(-0.439822971502571
-0.4257792915650726) #(-0.408407044966673
-0.3971478906347805) #(-0.37699111843077526
-0.3681245526846780 3) #(-0.345575191894877 3
-0.3387379202452914) #(-0.3141592653589793
```

-0.3090169943749474) #(-0.2827433382308156
-0.2789911060392294) #(-0.2513274122871836
-0.2486898871648549) #(-0.2199114857512856
-0.21814324139654262) #(-0.1884955921538763
-0.18738131458572466) #(-0.15707963267948966
-0.1564344650402387) #(-0.12566370614359168
-0.1253332335643042) #(-0.09424777960769393
-0.09410831331851445) #(-0.06283185307179595
-0.06279051952931346) #(-0.031415926535897976
-0.03141075907812834) #(0.0 0.0) #(0.031415926535897976
0.03141075907812834) #(0.06283185307179595
0.06279051952931346) #(0.09424777960769393
0.09410831331851445) #(0.1256637061435919
0.12533323356430442) #(0.15707963267948988
0.1564344650402311) #(0.1884955921538785
0.18738131458572488) #(0.2199114857512538
0.21814324139654243) #(0.2513274122871836
0.24868988716485468) #(0.2827433382308134
0.2789911060392292) #(0.3141592653589793
0.3090169943749474) #(0.3455751918948773
0.3387379202452914) #(0.37699111843077526
0.36812455268467803) #(0.40840704496673
0.3971478906347805) #(0.4398229715025712
0.42577929156507277) #(0.4712388980384689
0.4539904997395468) #(0.5026548245743672
0.4817536741017155) #(0.5340707511102649
0.5090414157503713) #(0.5654866776461631
0.5358267949789969) #(0.5969026041820604
0.5620833778521304) #(0.6283185307179586
0.5877852522924731) #(0.6597344572538564
0.6129070536529764) #(0.6911503837897546
0.6374239897486897) #(0.7225663103256523
0.6613118653236518) #(0.7539822368615505
0.6845471059286887) #(0.7853981633974483
0.7071067811865475) #(0.816814089933346
0.7289686274214113) #(0.8482300164692442
0.7501110696304596) #(0.879645943005142
0.7705132427757891) #(0.9110618695410402
0.7901550123756904) #(0.9424777960769379
0.8090169943749475) #(0.9738937226128361
0.8270805742745619) #(1.005309649148734
0.8443279255020149) #(1.0367255756846316

```
0.8607420270039435) #(1.0681415022205294
0.8763066800438635) #(1.0995574287564276
0.8910065241883679) #(1.1309733552923253
0.9048270524660195) #(1.1623892818282235
0.9177546256839811) #(1.1938052083641213
0.9297764858882513) #(1.2252211349000195
0.9408807689542256) #(1.2566370614359172
0.9510565162951535) #(1.2880529879718154
0.9602936856769432) #(1.3194689145077132
0.9685831611286311) #(1.3508848410436114
0.9759167619387474) #(1.3823007675795087
0.9822872507286886) #(1.413716694115407
0.9876883405951378) #(1.4451326206513047
0.9921147013144778) #(1.4765485471872029 0.99556196460308)
#(1.5079644737231006 0.9980267284282716)
#(1.5393804002589988 0.9995065603657316))
```




```
0
1000
2000
3000
4000
5000
6000
7000
```

8000
9000
10000
11000
12000
13000
14000
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17000
18000
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22000
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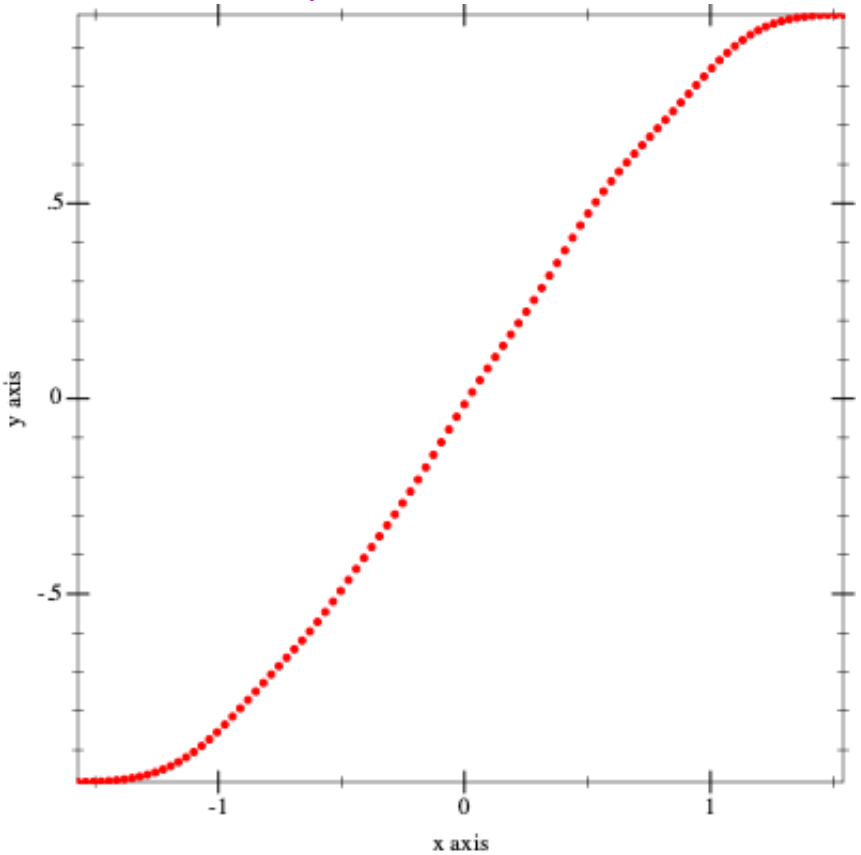
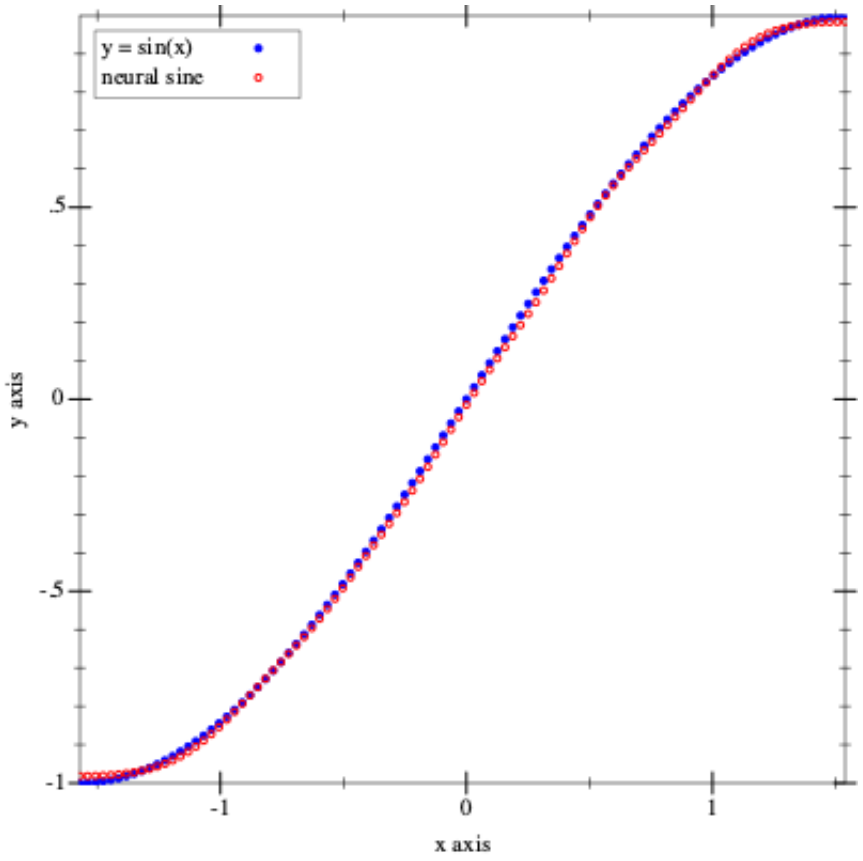
36000
37000
38000
39000
40000
41000
42000
43000
44000
45000
46000
47000
48000
49000

```
Test des exemples :
#(-0.5248011714325682) --> #(-0.511697826724621) : on
attendait #(-0.5010409436480776)
#(-1.3379378026775404) --> #(-0.9704562812353577) : on
attendait #(-0.9730107386543255)
#(0.40632861172910606) --> #(0.3776398244344421) : on
attendait #(0.3952395424739412)
#(-0.6083331511942834) --> #(-0.5808777380352484) : on
attendait #(-0.5715004355905013)
#(-0.3008974370260844) --> #(-0.3126970667714175) : on
attendait #(-0.296377441878989)
#(-0.7479160169861759) --> #(-0.6807551822748271) : on
attendait #(-0.6801124537799255)
#(1.4354078821377456) --> #(0.9815397361762372) : on
attendait #(0.9908489755604684)
#(-0.6426716627825968) --> #(-0.606964141325650 4) : on
attendait #(-0.599336236873342)
#(-0.08369883581716264) --> #(-0.100615423729940 3) : on
attendait #(-0.083601144744553 67)
#(1.1867540244821444) --> #(0.9408665614611825) : on
attendait #(0.9271576797121787)
Error on examples=0.0015390590410949 64
```

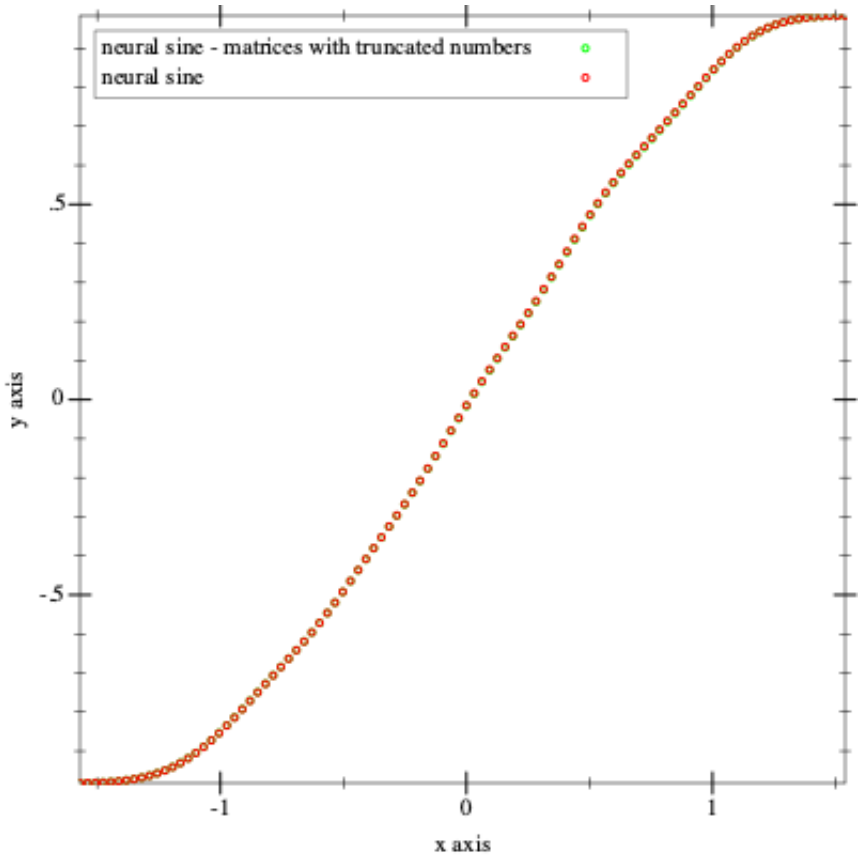





```
Matrix vector M=
#((flomat 70 2 ...) (flomat 70 71 ...) (flomat:
((-0.6619807901582975 -0.4737768371139214
-0.7078011565109767 0.5791929935098333
-0.03935637226518891 0.16777652387129116
0.7997643516588997 0.9804547263186936 0.2994968327318799
-0.8991063079717566 -0.5730044815690072
-0.9217502859178812 0.23583358938652954
-0.17151102185021743 -0.10257283522008478
0.09594303895683351 0.11519689291565628
-0.1418571542200748 -0.33888755929676706
0.37532846189470714 0.4527198383947423 0.80780274978186
0.8914288834552173 -0.322802018089066 -0.7068875761963405
0.4576912290974067 0.4813823822125027 0.1470182925760294
0.9325935703512306 -0.4360719171360888 0.11910593931320643
-0.5894023374540589 0.2598412711488805 0.03523066361372713
-0.4119550497418043 -0.39730242442664665
-0.6786486893144837 -0.8106296361859988
-0.13594731538301716 0.8598534621501353 1.0032341402375573
0.460100598566314 -0.8675590342046242 -0.6970879036585963
-0.5426707567016125 -0.823298099352991 0.3172527016640863
-0.3393079103963251 0.30226128085533654
-0.26749645438365693 -0.8137505417842985
```

```
-0.6610973715674748 -0.33723588630517415
0.8763280389294331 0.4398993777073877 -0.3650706649617116
-0.6879368538347391 0.16385891459581572
-0.6446146608843102 0.25666388736308443 0.4978582419589434
0.1288641247813719 0.7881651525682878 0.8065061036524872
-0.7937868210849799 -0.9026399473415112
-0.14814465072659982 0.4546796543220005
0.10663826254270432 0.1825506822628948
0.6677809417025773))))
precision=1000.0
Matrix vector modified M=
#((flomat 70 2 ...) (flomat 70 71 ...) (flomat: ((-0.662
-0.474 -0.708 0.579 -0.039 0.168 0.8 0.98 0.299 -0.899
-0.573 -0.922 0.236 -0.172 -0.103 0.096 0.115 -0.142
-0.339 0.375 0.453 0.808 0.891 -0.323 -0.707 0.458 0.481
0.147 0.933 -0.436 0.119 -0.589 0.26 0.035 -0.412 -0.397
-0.679 -0.811 -0.136 0.86 1.003 0.46 -0.868 -0.697 -0.543
-0.823 0.317 -0.339 0.302 -0.267 -0.814 -0.661 -0.337
0.876 0.44 -0.365 -0.688 0.164 -0.645 0.257 0.498 0.129
0.788 0.807 -0.794 -0.903 -0.148 0.455 0.107 0.183
0.668))))
Test des exemples :
#(-0.5248011714325682) --> #(-0.51191228899564) : on
attendait #(-0.5010409436480776)
#(-1.3379378026775404) --> #(-0.9703078541075946) : on
attendait #(-0.9730107386543255)
#(0.4063286117291060 6) --> #(0.3753566273293885 7) : on
attendait #(0.3952395424739412)
#(-0.6083331511942834) --> #(-0.5809191644180132) : on
attendait #(-0.5715004355905013)
#(-0.3008974370260844) --> #(-0.31342246870674) : on
attendait #(-0.296377441878989)
#(-0.7479160169861759) --> #(-0.6804990500291508) : on
attendait #(-0.6801124537799255)
#(1.4354078821377456) --> #(0.9813359934526824) : on
attendait #(0.9908489755604684)
#(-0.6426716627825968) --> #(-0.6069325887998773) : on
attendait #(-0.599336236873342)
#(-0.083698835817162 64) --> #(-0.1020898911855870 6) : on
attendait #(-0.0836011447445536 7)
#(1.1867540244821444) --> #(0.940142782025123) : on
attendait #(0.9271576797121787)
```

Error on examples=0.0030979239574375275



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