PROBLEM 1

bern(0)

ans =

-1

bern(1)

ans =

-8.333333333333334e-02

bern(2)

ans =

1.388888888888891e-03

bern(3)

ans =

-3.306878306878335e-05

bern(4)

ans =

8.267195767196095e-07

bern(5)

ans =

-2.087675698787157e-08

bern(6)

ans =

5.284190138691068e-10

bern(7)

ans =

-1.338253653072106e-11

bern(8)

ans =

3.389680296359488e-13

bern(9)

ans =

-8.586062056651918e-15

bern(10)

ans =

2.174868698937123e-16

diary off

PROBLEM 5

gadap(0,1,@(x) x^-x,0,10^-1)

1

ans =

1.291537197998492e+00

gadap(0,1,@(x) x^-x,0,10^-2)

1

ans =

1.291537197998492e+00

gadap(0,1,@(x) x^-x,0,10^-3)

1

ans =

1.291537197998492e+00

gadap(0,1,@(x) x^-x,0,10^-4)

1

2

3

ans =

1.291351947020117e+00

gadap(0,1,@(x) x^-x,0,10^-5)

1

2

3

4

5

6

7

8

9

10

11

ans =

1.291286273300089e+00

gadap(0,1,@(x) x^-x,0,10^-6)

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

ans =

1.291286001537428e+00

gadap(0,1,@(x) x^-x,0,10^-7)

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

ans =

1.291285997208071e+00

gadap(0,1,@(x) x^-x,0,10^-8)

1

2

3

4

5

6

7

8

9

10

11

12

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14

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17

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30

31

ans =

1.291285997191336e+00

gadap(0,1,@(x) x^-x,0,10^-9)

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

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21

22

23

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31

32

33

34

35

36

37

ans =

1.291285997191074e+00

gadap(0,1,@(x) x^-x,0,10^-10)

1

2

3

4

5

6

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8

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12

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21

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42

43

44

45

46

47

ans =

1.291285997098493e+00

diary off

PROBLEM 6

pleg(1/2, 1)

ans =

5.000000000000000e-01

pleg(1/2, 2)

ans =

-8.333333333333331e-02

pleg(1/2, 3)

ans =

-1.750000000000000e-01

pleg(1/2, 4)

ans =

-6.607142857142857e-02

pleg(1/2, 5)

ans =

1.140873015873015e-02

diary off

PROBLEM 7

[a b] = gaussint(1)

a =

2

b =

0

[a b] = gaussint(2)

a =

1 1

b =

-5.773502691896257e-01 5.773502691896257e-01

[a b] = gaussint(3)

a =

5.555555555555555e-01 8.888888888888888e-01 5.555555555555556e-01

b =

-7.745966692414834e-01 0 7.745966692414834e-01

[a b] = gaussint(4)

a =

Columns 1 through 3

3.478548451374538e-01 6.521451548625460e-01 6.521451548625460e-01

Column 4

3.478548451374540e-01

b =

Columns 1 through 3

-8.611363115940526e-01 -3.399810435848562e-01 3.399810435848562e-01

Column 4

8.611363115940526e-01

[a b] = gaussint(5)

a =

Columns 1 through 3

2.369268850561893e-01 4.786286704993662e-01 5.688888888888893e-01

Columns 4 through 5

4.786286704993661e-01 2.369268850561893e-01

b =

Columns 1 through 3

-9.061798459386639e-01 -5.384693101056831e-01 0

Columns 4 through 5

5.384693101056831e-01 9.061798459386639e-01

[a b] = gaussint(6)

a =

Columns 1 through 3

1.713244923791704e-01 3.607615730481383e-01 4.679139345726911e-01

Columns 4 through 6

4.679139345726910e-01 3.607615730481384e-01 1.713244923791704e-01

b =

Columns 1 through 3

-9.324695142031519e-01 -6.612093864662645e-01 -2.386191860831969e-01

Columns 4 through 6

2.386191860831969e-01 6.612093864662645e-01 9.324695142031519e-01

diary off

[a b] = gaussint(1)

a =

2

b =

0

summat(1,1,@(x) a(x)\*b(x))

ans =

0

[a b] = gaussint(2)

a =

1 1

b =

-5.773502691896257e-01 5.773502691896257e-01

summat(1,2,@(x) a(x)\*b(x))

ans =

0

[a b] = gaussint(3)

a =

5.555555555555555e-01 8.888888888888888e-01 5.555555555555556e-01

b =

-7.745966692414834e-01 0 7.745966692414834e-01

summat(1,3,@(x) a(x)\*b(x))

ans =

5.551115123125783e-17

[a b] = gaussint(4)

a =

Columns 1 through 3

3.478548451374538e-01 6.521451548625460e-01 6.521451548625460e-01

Column 4

3.478548451374540e-01

b =

Columns 1 through 3

-8.611363115940526e-01 -3.399810435848562e-01 3.399810435848562e-01

Column 4

8.611363115940526e-01

summat(1,4,@(x) a(x)\*b(x))

ans =

1.665334536937735e-16

[a b] = gaussint(5)

a =

Columns 1 through 3

2.369268850561893e-01 4.786286704993662e-01 5.688888888888893e-01

Columns 4 through 5

4.786286704993661e-01 2.369268850561893e-01

b =

Columns 1 through 3

-9.061798459386639e-01 -5.384693101056831e-01 0

Columns 4 through 5

5.384693101056831e-01 9.061798459386639e-01

summat(1,5,@(x) a(x)\*b(x))

ans =

-2.775557561562891e-17

[a b] = gaussint(6)

a =

Columns 1 through 3

1.713244923791704e-01 3.607615730481383e-01 4.679139345726911e-01

Columns 4 through 6

4.679139345726910e-01 3.607615730481384e-01 1.713244923791704e-01

b =

Columns 1 through 3

-9.324695142031519e-01 -6.612093864662645e-01 -2.386191860831969e-01

Columns 4 through 6

2.386191860831969e-01 6.612093864662645e-01 9.324695142031519e-01

summat(1,6,@(x) a(x)\*b(x))

ans =

-2.775557561562891e-17

[a b] = gaussint(7)

a =

Columns 1 through 3

1.294849661688696e-01 2.797053914892768e-01 3.818300505051188e-01

Columns 4 through 6

4.179591836734694e-01 3.818300505051188e-01 2.797053914892769e-01

Column 7

1.294849661688696e-01

b =

Columns 1 through 3

-9.491079123427586e-01 -7.415311855993945e-01 -4.058451513773971e-01

Columns 4 through 6

0 4.058451513773971e-01 7.415311855993945e-01

Column 7

9.491079123427586e-01

summat(1,7,@(x) a(x)\*b(x))

ans =

1.249000902703301e-16

[a b] = gaussint(8)

a =

Columns 1 through 3

1.012285362903763e-01 2.223810344533744e-01 3.137066458778875e-01

Columns 4 through 6

3.626837833783618e-01 3.626837833783618e-01 3.137066458778874e-01

Columns 7 through 8

2.223810344533743e-01 1.012285362903763e-01

b =

Columns 1 through 3

-9.602898564975362e-01 -7.966664774136267e-01 -5.255324099163290e-01

Columns 4 through 6

-1.834346424956498e-01 1.834346424956498e-01 5.255324099163290e-01

Columns 7 through 8

7.966664774136267e-01 9.602898564975362e-01

summat(1,8,@(x) a(x)\*b(x))

ans =

-2.775557561562891e-17

[a b] = gaussint(9)

a =

Columns 1 through 3

8.127438836157437e-02 1.806481606948574e-01 2.606106964029357e-01

Columns 4 through 6

3.123470770400026e-01 3.302393550012598e-01 3.123470770400025e-01

Columns 7 through 9

2.606106964029356e-01 1.806481606948573e-01 8.127438836157438e-02

b =

Columns 1 through 3

-9.681602395076261e-01 -8.360311073266359e-01 -6.133714327005904e-01

Columns 4 through 6

-3.242534234038089e-01 0 3.242534234038089e-01

Columns 7 through 9

6.133714327005904e-01 8.360311073266359e-01 9.681602395076261e-01

summat(1,9,@(x) a(x)\*b(x))

ans =

-1.942890293094024e-16

[a b] = gaussint(10)

a =

Columns 1 through 3

6.667134430868817e-02 1.494513491505807e-01 2.190863625159819e-01

Columns 4 through 6

2.692667193099965e-01 2.955242247147529e-01 2.955242247147528e-01

Columns 7 through 9

2.692667193099965e-01 2.190863625159819e-01 1.494513491505806e-01

Column 10

6.667134430868815e-02

b =

Columns 1 through 3

-9.739065285171717e-01 -8.650633666889844e-01 -6.794095682990244e-01

Columns 4 through 6

-4.333953941292472e-01 -1.488743389816312e-01 1.488743389816312e-01

Columns 7 through 9

4.333953941292472e-01 6.794095682990244e-01 8.650633666889844e-01

Column 10

9.739065285171717e-01

summat(1,10,@(x) a(x)\*b(x))

ans =

-1.387778780781446e-16

[a b] = gaussint(11)

a =

Columns 1 through 3

5.566856711617369e-02 1.255803694649046e-01 1.862902109277342e-01

Columns 4 through 6

2.331937645919904e-01 2.628045445102465e-01 2.729250867779006e-01

Columns 7 through 9

2.628045445102467e-01 2.331937645919905e-01 1.862902109277343e-01

Columns 10 through 11

1.255803694649046e-01 5.566856711617369e-02

b =

Columns 1 through 3

-9.782286581460570e-01 -8.870625997680953e-01 -7.301520055740494e-01

Columns 4 through 6

-5.190961292068118e-01 -2.695431559523450e-01 0

Columns 7 through 9

2.695431559523450e-01 5.190961292068118e-01 7.301520055740494e-01

Columns 10 through 11

8.870625997680953e-01 9.782286581460570e-01

summat(1,11,@(x) a(x)\*b(x))

ans =

2.498001805406602e-16

[a b] = gaussint(12)

a =

Columns 1 through 3

4.717533638651186e-02 1.069393259953183e-01 1.600783285433464e-01

Columns 4 through 6

2.031674267230661e-01 2.334925365383546e-01 2.491470458134028e-01

Columns 7 through 9

2.491470458134029e-01 2.334925365383549e-01 2.031674267230660e-01

Columns 10 through 12

1.600783285433464e-01 1.069393259953183e-01 4.717533638651187e-02

b =

Columns 1 through 3

-9.815606342467192e-01 -9.041172563704749e-01 -7.699026741943048e-01

Columns 4 through 6

-5.873179542866174e-01 -3.678314989981802e-01 -1.252334085114689e-01

Columns 7 through 9

1.252334085114689e-01 3.678314989981802e-01 5.873179542866174e-01

Columns 10 through 12

7.699026741943048e-01 9.041172563704749e-01 9.815606342467192e-01

summat(1,12,@(x) a(x)\*b(x))

ans =

-4.857225732735060e-17

[a b] = gaussint(13)

a =

Columns 1 through 3

4.048400476531579e-02 9.212149983772872e-02 1.388735102197871e-01

Columns 4 through 6

1.781459807619459e-01 2.078160475368883e-01 2.262831802628973e-01

Columns 7 through 9

2.325515532308737e-01 2.262831802628973e-01 2.078160475368883e-01

Columns 10 through 12

1.781459807619461e-01 1.388735102197872e-01 9.212149983772869e-02

Column 13

4.048400476531577e-02

b =

Columns 1 through 3

-9.841830547185882e-01 -9.175983992229779e-01 -8.015780907333099e-01

Columns 4 through 6

-6.423493394403401e-01 -4.484927510364468e-01 -2.304583159551348e-01

Columns 7 through 9

0 2.304583159551348e-01 4.484927510364468e-01

Columns 10 through 12

6.423493394403401e-01 8.015780907333099e-01 9.175983992229779e-01

Column 13

9.841830547185882e-01

summat(1,13,@(x) a(x)\*b(x))

ans =

2.220446049250313e-16

[a b] = gaussint(14)

a =

Columns 1 through 3

3.511946033175197e-02 8.015808715976014e-02 1.215185706879031e-01

Columns 4 through 6

1.572031671581934e-01 1.855383974779377e-01 2.051984637212956e-01

Columns 7 through 9

2.152638534631578e-01 2.152638534631577e-01 2.051984637212957e-01

Columns 10 through 12

1.855383974779378e-01 1.572031671581936e-01 1.215185706879031e-01

Columns 13 through 14

8.015808715976015e-02 3.511946033175196e-02

b =

Columns 1 through 3

-9.862838086968123e-01 -9.284348836635734e-01 -8.272013150697650e-01

Columns 4 through 6

-6.872929048116855e-01 -5.152486363581541e-01 -3.191123689278897e-01

Columns 7 through 9

-1.080549487073437e-01 1.080549487073437e-01 3.191123689278897e-01

Columns 10 through 12

5.152486363581541e-01 6.872929048116855e-01 8.272013150697650e-01

Columns 13 through 14

9.284348836635734e-01 9.862838086968123e-01

summat(1,14,@(x) a(x)\*b(x))

ans =

2.151057110211241e-16

[a b] = gaussint(15)

a =

Columns 1 through 3

3.075324199611731e-02 7.036604748810786e-02 1.071592204671721e-01

Columns 4 through 6

1.395706779261543e-01 1.662692058169939e-01 1.861610000155619e-01

Columns 7 through 9

1.984314853271120e-01 2.025782419255610e-01 1.984314853271121e-01

Columns 10 through 12

1.861610000155618e-01 1.662692058169941e-01 1.395706779261544e-01

Columns 13 through 15

1.071592204671720e-01 7.036604748810803e-02 3.075324199611730e-02

b =

Columns 1 through 3

-9.879925180204854e-01 -9.372733924007060e-01 -8.482065834104272e-01

Columns 4 through 6

-7.244177313601701e-01 -5.709721726085387e-01 -3.941513470775634e-01

Columns 7 through 9

-2.011940939974345e-01 0 2.011940939974345e-01

Columns 10 through 12

3.941513470775634e-01 5.709721726085387e-01 7.244177313601701e-01

Columns 13 through 15

8.482065834104272e-01 9.372733924007060e-01 9.879925180204854e-01

summat(1,15,@(x) a(x)\*b(x))

ans =

2.220446049250313e-16

[a b] = gaussint(16)

a =

Columns 1 through 3

2.715245941175409e-02 6.225352393864805e-02 9.515851168249281e-02

Columns 4 through 6

1.246289712555338e-01 1.495959888165764e-01 1.691565193950027e-01

Columns 7 through 9

1.826034150449237e-01 1.894506104550683e-01 1.894506104550684e-01

Columns 10 through 12

1.826034150449236e-01 1.691565193950026e-01 1.495959888165768e-01

Columns 13 through 15

1.246289712555338e-01 9.515851168249277e-02 6.225352393864802e-02

Column 16

2.715245941175411e-02

b =

Columns 1 through 3

-9.894009349916499e-01 -9.445750230732325e-01 -8.656312023878316e-01

Columns 4 through 6

-7.554044083550030e-01 -6.178762444026438e-01 -4.580167776572274e-01

Columns 7 through 9

-2.816035507792589e-01 -9.501250983763744e-02 9.501250983763744e-02

Columns 10 through 12

2.816035507792589e-01 4.580167776572274e-01 6.178762444026438e-01

Columns 13 through 15

7.554044083550030e-01 8.656312023878316e-01 9.445750230732325e-01

Column 16

9.894009349916499e-01

summat(1,16,@(x) a(x)\*b(x))

ans =

2.463307335887066e-16

[a b] = gaussint(17)

a =

Columns 1 through 3

2.414830286854804e-02 5.545952937398715e-02 8.503614831717915e-02

Columns 4 through 6

1.118838471934038e-01 1.351363684685256e-01 1.540457610768099e-01

Columns 7 through 9

1.680041021564502e-01 1.765627053669926e-01 1.794464703562065e-01

Columns 10 through 12

1.765627053669925e-01 1.680041021564501e-01 1.540457610768100e-01

Columns 13 through 15

1.351363684685259e-01 1.118838471934038e-01 8.503614831717904e-02

Columns 16 through 17

5.545952937398717e-02 2.414830286854805e-02

b =

Columns 1 through 3

-9.905754753144173e-01 -9.506755217687677e-01 -8.802391537269858e-01

Columns 4 through 6

-7.815140038968015e-01 -6.576711592166907e-01 -5.126905370864769e-01

Columns 7 through 9

-3.512317634538763e-01 -1.784841814958478e-01 0

Columns 10 through 12

1.784841814958478e-01 3.512317634538763e-01 5.126905370864769e-01

Columns 13 through 15

6.576711592166907e-01 7.815140038968015e-01 8.802391537269858e-01

Columns 16 through 17

9.506755217687677e-01 9.905754753144173e-01

summat(1,17,@(x) a(x)\*b(x))

ans =

1.075528555105620e-16

[a b] = gaussint(18)

a =

Columns 1 through 3

2.161601352648320e-02 4.971454889496994e-02 7.642573025488908e-02

Columns 4 through 6

1.009420441062872e-01 1.225552067114784e-01 1.406429146706508e-01

Columns 7 through 9

1.546846751262653e-01 1.642764837458328e-01 1.691423829631435e-01

Columns 10 through 12

1.691423829631434e-01 1.642764837458328e-01 1.546846751262654e-01

Columns 13 through 15

1.406429146706507e-01 1.225552067114783e-01 1.009420441062872e-01

Columns 16 through 18

7.642573025488893e-02 4.971454889496994e-02 2.161601352648324e-02

b =

Columns 1 through 3

-9.915651684209310e-01 -9.558239495713977e-01 -8.926024664975557e-01

Columns 4 through 6

-8.037049589725230e-01 -6.916870430603532e-01 -5.597708310739475e-01

Columns 7 through 9

-4.117511614628427e-01 -2.518862256915055e-01 -8.477501304173531e-02

Columns 10 through 12

8.477501304173531e-02 2.518862256915055e-01 4.117511614628427e-01

Columns 13 through 15

5.597708310739475e-01 6.916870430603532e-01 8.037049589725230e-01

Columns 16 through 18

8.926024664975557e-01 9.558239495713977e-01 9.915651684209310e-01

summat(1,18,@(x) a(x)\*b(x))

ans =

-1.491862189340054e-16

[a b] = gaussint(19)

a =

Columns 1 through 3

1.946178822972638e-02 4.481422676569952e-02 6.904454273764134e-02

Columns 4 through 6

9.149002162245010e-02 1.115666455473339e-01 1.287539625393364e-01

Columns 7 through 9

1.426067021736064e-01 1.527660420658598e-01 1.589688433939541e-01

Columns 10 through 12

1.610544498487837e-01 1.589688433939546e-01 1.527660420658599e-01

Columns 13 through 15

1.426067021736063e-01 1.287539625393364e-01 1.115666455473339e-01

Columns 16 through 18

9.149002162244997e-02 6.904454273764124e-02 4.481422676569961e-02

Column 19

1.946178822972638e-02

b =

Columns 1 through 3

-9.924068438435845e-01 -9.602081521348301e-01 -9.031559036148180e-01

Columns 4 through 6

-8.227146565371428e-01 -7.209661773352295e-01 -6.005453046616811e-01

Columns 7 through 9

-4.645707413759609e-01 -3.165640999636298e-01 -1.603586456402254e-01

Columns 10 through 12

0 1.603586456402254e-01 3.165640999636298e-01

Columns 13 through 15

4.645707413759609e-01 6.005453046616811e-01 7.209661773352295e-01

Columns 16 through 18

8.227146565371428e-01 9.031559036148180e-01 9.602081521348301e-01

Column 19

9.924068438435845e-01

summat(1,19,@(x) a(x)\*b(x))

ans =

-1.214306433183765e-16

[a b] = gaussint(20)

a =

Columns 1 through 3

1.761400713915220e-02 4.060142980038688e-02 6.267204833410896e-02

Columns 4 through 6

8.327674157670502e-02 1.019301198172403e-01 1.181945319615184e-01

Columns 7 through 9

1.316886384491765e-01 1.420961093183819e-01 1.491729864726037e-01

Columns 10 through 12

1.527533871307259e-01 1.527533871307259e-01 1.491729864726037e-01

Columns 13 through 15

1.420961093183819e-01 1.316886384491768e-01 1.181945319615185e-01

Columns 16 through 18

1.019301198172403e-01 8.327674157670489e-02 6.267204833410898e-02

Columns 19 through 20

4.060142980038691e-02 1.761400713915222e-02

b =

Columns 1 through 3

-9.931285991850949e-01 -9.639719272779137e-01 -9.122344282513259e-01

Columns 4 through 6

-8.391169718222188e-01 -7.463319064601507e-01 -6.360536807265150e-01

Columns 7 through 9

-5.108670019508270e-01 -3.737060887154196e-01 -2.277858511416451e-01

Columns 10 through 12

-7.652652113349732e-02 7.652652113349732e-02 2.277858511416451e-01

Columns 13 through 15

3.737060887154196e-01 5.108670019508270e-01 6.360536807265150e-01

Columns 16 through 18

7.463319064601507e-01 8.391169718222188e-01 9.122344282513259e-01

Columns 19 through 20

9.639719272779137e-01 9.931285991850949e-01

summat(1,20,@(x) a(x)\*b(x))

ans =

2.532696274926138e-16

diary off

ectr(20,2)

ans =

Columns 1 through 2

5.000000000000000e-01 1.000000000000000e+00

Columns 3 through 4

1.000000000000000e+00 1.000000000000000e+00

Columns 5 through 6

1.000000000000000e+00 1.000000000000000e+00

Columns 7 through 8

1.000000000000000e+00 1.000000000000000e+00

Columns 9 through 10

1.000000000000000e+00 1.000000000000000e+00

Columns 11 through 12

1.000000000000000e+00 1.000000000000000e+00

Columns 13 through 14

1.000000000000000e+00 1.000000000000000e+00

Columns 15 through 16

1.000000000000000e+00 1.000000000000000e+00

Columns 17 through 18

1.000000000000000e+00 1.000000000000000e+00

Columns 19 through 20

1.000000000000000e+00 5.000000000000000e-01

ectr(20,4)

ans =

Columns 1 through 2

3.750000000000000e-01 1.166666666666667e+00

Columns 3 through 4

9.583333333333334e-01 1.000000000000000e+00

Columns 5 through 6

1.000000000000000e+00 1.000000000000000e+00

Columns 7 through 8

1.000000000000000e+00 1.000000000000000e+00

Columns 9 through 10

1.000000000000000e+00 1.000000000000000e+00

Columns 11 through 12

1.000000000000000e+00 1.000000000000000e+00

Columns 13 through 14

1.000000000000000e+00 1.000000000000000e+00

Columns 15 through 16

1.000000000000000e+00 1.000000000000000e+00

Columns 17 through 18

1.000000000000000e+00 9.583333333333334e-01

Columns 19 through 20

1.166666666666667e+00 3.750000000000000e-01

ectr(20,6)

ans =

Columns 1 through 2

4.999173280423280e-01 1.000297619047619e+00

Columns 3 through 4

9.996031746031746e-01 1.000231481481481e+00

Columns 5 through 6

9.999503968253968e-01 1.000000000000000e+00

Columns 7 through 8

1.000000000000000e+00 1.000000000000000e+00

Columns 9 through 10

1.000000000000000e+00 1.000000000000000e+00

Columns 11 through 12

1.000000000000000e+00 1.000000000000000e+00

Columns 13 through 14

1.000000000000000e+00 1.000000000000000e+00

Columns 15 through 16

1.000000000000000e+00 9.999503968253968e-01

Columns 17 through 18

1.000231481481481e+00 9.996031746031746e-01

Columns 19 through 20

1.000297619047619e+00 4.999173280423280e-01

ectr(20,8)

ans =

Columns 1 through 2

4.999999269313505e-01 1.000000417535140e+00

Columns 3 through 4

9.999990083540431e-01 1.000001252605419e+00

Columns 5 through 6

9.999991127378280e-01 1.000000334028112e+00

Columns 7 through 8

9.999999478081075e-01 1.000000000000000e+00

Columns 9 through 10

1.000000000000000e+00 1.000000000000000e+00

Columns 11 through 12

1.000000000000000e+00 1.000000000000000e+00

Columns 13 through 14

1.000000000000000e+00 9.999999478081075e-01

Columns 15 through 16

1.000000334028112e+00 9.999991127378280e-01

Columns 17 through 18

1.000001252605419e+00 9.999990083540431e-01

Columns 19 through 20

1.000000417535140e+00 4.999999269313505e-01

ectr(20,10)

ans =

Columns 1 through 2

4.999999999397786e-01 1.000000000468389e+00

Columns 3 through 4

9.999999984074781e-01 1.000000003091366e+00

Columns 5 through 6

9.999999962528898e-01 1.000000002904010e+00

Columns 7 through 8

9.999999985948337e-01 1.000000000388094e+00

Columns 9 through 10

9.999999999531611e-01 1.000000000000000e+00

Columns 11 through 12

1.000000000000000e+00 9.999999999531611e-01

Columns 13 through 14

1.000000000388094e+00 9.999999985948337e-01

Columns 15 through 16

1.000000002904010e+00 9.999999962528898e-01

Columns 17 through 18

1.000000003091366e+00 9.999999984074781e-01

Columns 19 through 20

1.000000000468389e+00 4.999999999397786e-01

diary off

PROBLEM 2

list = 1:20

list =

Columns 1 through 9

1 2 3 4 5 6 7 8 9

Columns 10 through 18

10 11 12 13 14 15 16 17 18

Columns 19 through 20

19 20

list = list / 20

list =

Columns 1 through 2

5.000000000000000e-02 1.000000000000000e-01

Columns 3 through 4

1.500000000000000e-01 2.000000000000000e-01

Columns 5 through 6

2.500000000000000e-01 3.000000000000000e-01

Columns 7 through 8

3.500000000000000e-01 4.000000000000000e-01

Columns 9 through 10

4.500000000000000e-01 5.000000000000000e-01

Columns 11 through 12

5.500000000000000e-01 6.000000000000000e-01

Columns 13 through 14

6.500000000000000e-01 7.000000000000000e-01

Columns 15 through 16

7.500000000000000e-01 8.000000000000000e-01

Columns 17 through 18

8.500000000000000e-01 9.000000000000000e-01

Columns 19 through 20

9.500000000000000e-01 1.000000000000000e+00

a = transpose(arrayfun(@(x) exp(1)^x, list))

a =

1.051271096376024e+00

1.105170918075648e+00

1.161834242728283e+00

1.221402758160170e+00

1.284025416687741e+00

1.349858807576003e+00

1.419067548593257e+00

1.491824697641270e+00

1.568312185490169e+00

1.648721270700128e+00

1.733253017867395e+00

1.822118800390509e+00

1.915540829013896e+00

2.013752707470477e+00

2.117000016612675e+00

2.225540928492468e+00

2.339646851925991e+00

2.459603111156950e+00

2.585709659315846e+00

2.718281828459046e+00

sum(sum(a\*ectr(20,4)))/32

ans =

2.091896241131078e+01

sum(sum(a\*ectr(20,6)))/32

ans =

2.091896241131078e+01

sum(sum(a\*ectr(20,8)))/32

ans =

2.091896241131078e+01

sum(sum(a\*ectr(20,10)))/32

ans =

2.091896241131078e+01

diary off

list = 1:20

list =

Columns 1 through 9

1 2 3 4 5 6 7 8 9

Columns 10 through 18

10 11 12 13 14 15 16 17 18

Columns 19 through 20

19 20

list = list / 20

list =

Columns 1 through 2

5.000000000000000e-02 1.000000000000000e-01

Columns 3 through 4

1.500000000000000e-01 2.000000000000000e-01

Columns 5 through 6

2.500000000000000e-01 3.000000000000000e-01

Columns 7 through 8

3.500000000000000e-01 4.000000000000000e-01

Columns 9 through 10

4.500000000000000e-01 5.000000000000000e-01

Columns 11 through 12

5.500000000000000e-01 6.000000000000000e-01

Columns 13 through 14

6.500000000000000e-01 7.000000000000000e-01

Columns 15 through 16

7.500000000000000e-01 8.000000000000000e-01

Columns 17 through 18

8.500000000000000e-01 9.000000000000000e-01

Columns 19 through 20

9.500000000000000e-01 1.000000000000000e+00

a = transpose(arrayfun(@(x) x^(-x), list))

a =

1.161586349641542e+00

1.258925411794167e+00

1.329187691976788e+00

1.379729661461215e+00

1.414213562373095e+00

1.435038734166447e+00

1.444029895591500e+00

1.442699905907213e+00

1.432367204368292e+00

1.414213562373095e+00

1.389314347712664e+00

1.358655182676538e+00

1.323141582238233e+00

1.283604916843771e+00

1.240806478802799e+00

1.195440624737546e+00

1.148137529655066e+00

1.099465842451349e+00

1.049935390761547e+00

1.000000000000000e+00

sum(sum(a\*ectr(20,4)))/32

ans =

1.531904323859765e+01

sum(sum(a\*ectr(20,6)))/32

ans =

1.531904323859764e+01

sum(sum(a\*ectr(20,8)))/32

ans =

1.531904323859764e+01

sum(sum(a\*ectr(20,10)))/32

ans =

1.531904323859764e+01

diary off

CODE FOR EVERYTHING:

#1:

function result = bern(n)

if n == 0

result = -1;

else

result = (-1/2 \* (1 / factorial(2\*n))) - summat(0, n-1, @(k) bern(k) / factorial(2\*n - (2\*k) + 1));

end

end

#2:

function w = ectr(n,k)

w = ones(1, n);

w(1) = 1/2;

w(n) = 1/2;

if k > 2

list = 0:k-2;

difnums = fornberg(k-3,0,list);

% w = ones(5,n);

% w(1,1) = 1/2;

% w(1,n) = 1/2;

%

% for i = 4:2:10

% difnums = fornberg(i-3,0,0:i-2);

% for j = 1:i-1

% w(i/2,j) = w(i/2,j) - (bern(i-3) \* difnums(j));

% w(i/2,n-j+1) = w(i/2,j);

% end

% end

for i = 1:k-1

w(i) = w(i) - (bern(k-3) \* difnums(i));

w(n-i+1) = w(i);

end

end

end

#4:

function [int, abt] = gadap(a,b,f,r,tol)

n = 10000;

abt = cell(1,n);

int = 0;

queue = cell(1,n);

queue{1} = [a,b,gquad5(a,b,f)];

queueIndex = 2;

abtIndex = 1;

numFuncCalls = 0;

while queueIndex ~= 1

x = queue{1};

queue(1) = [];

queueIndex = queueIndex - 1;

numFuncCalls = numFuncCalls + 1;

newa = x(1);

mid = (x(1) + x(2)) / 2;

newb = x(2);

[~, col] = size(queue);

if col > n

break

end

errorest = abs(x(3) - (gquad5(newa,mid,f) + gquad5(mid,newb,f)));

%disp(errorest / (tol \* max(abs(x(3)), abs(gquad5(newa,mid,f)) + abs(gquad5(mid,newb,f)))))

if errorest < tol \* max(abs(x(3)), abs(gquad5(newa,mid,f)) + abs(gquad5(mid,newb,f)))

abt{abtIndex} = x;

int = int + x(3);

abtIndex = abtIndex + 1;

else

queue{queueIndex} = [newa mid gquad5(newa,mid,f)];

queue{queueIndex + 1} = [mid newb gquad5(mid,newb,f)];

queueIndex = queueIndex + 2;

end

end

for i = 1:queueIndex - 1

abt{abtIndex} = queue{i};

abtIndex = abtIndex + 1;

int = int + queue{i}(3);

end

end

#6:

function p = pleg(t,n)

if n == 0

p = 1;

elseif n == 1

p = t;

else

last1 = t;

last2 = 1;

c = 2;

while c <= n

p = t\*last1 - ((c-1)^2 / (4\*(c-1)^2 - 1)\*last2);

last2 = last1;

last1 = p;

c = c + 1;

end

end

end

#7:

function [w,t] = gaussint(n)

bounds = [-1, 1];

for i = 1:n

[~,boundssize] = size(bounds);

new = zeros(1, boundssize + 1);

new(1) = -1;

new(boundssize + 1) = 1;

for j = 2:boundssize

new(j) = bisection(bounds(j-1),bounds(j),@(x) pleg(x,i), 0, eps);

end

bounds = new;

end

t = bounds(2:boundssize);

%w = gadap(-1, 1, linterp(1, t), 0, eps);

w = zeros(size(t));

[~, tcol] = size(t);

for j = 1:tcol

w(j) = gadap(-1, 1, linterp(j, t), 0, eps);

end

end

MISCELLANEOUS HELPER FUNCTIONS:

function [r, h] = bisection(a, b, f, p, t)

h = [];

cond = true;

while cond

assert(sign(f(a)) ~= sign(f(b)),"bounds wrong")

if 0 < a && 0 < b

m = sqrt(a\*b);

elseif a < 0 && b < 0

m = -sqrt(a\*b);

elseif a == 0

m = realmin;

elseif b == 0

m = -realmin;

elseif a < 0 && b > 0

m = 0;

end

h = [h [a;b;f(m)]];

if m == a || m == b

cond = false;

end

if (b-a) <= t\*min(abs(a), abs(b))

cond = false;

end

if f(m) == 0

cond = false;

end

if sign(f(m)) == sign(f(a)) || m == realmin

a = m;

elseif sign(f(m)) == sign(f(b)) || m == -realmin

b = m;

end

end

r = m;

function d = fornberg(M, x0 , alphas)

N = length(alphas) - 1 ;

deltas(1, 1, 1) = 1; %Delta(M,N,K) for the order of indexing .

c1 = 1;

for n = 1:N

c2 = 1;

for v = 0:(n-1)

c3 = alphas(n+1) - alphas(v+1);

c2 = c2 \* c3 ;

if n <= M

deltas(n+1, n, v+1) = 0;

end

for m = 0:min(n, M)

if m == 0

D = 0;

else

D = m \* deltas(m, n, v+1);

end

D2 = (alphas(n+1)-x0) \* deltas(m+1, n, v+1);

deltas(m+1,n+1,v+1) = (D2-D)/c3;

end

end

for m = 0:min(n, M)

if m == 0

D = 0;

else

D = m \* deltas(m, n, n);

end

D2 = (alphas(n)-x0) \* deltas(m+1,n,n);

deltas(m+1,n+1,n+1) = (c1/c2) \* (D-D2);

end

c1 = c2;

end

d = deltas(end,end,:) ;

d = reshape(d,1,[]);

end

function result = gquad5(a,b,f)

x1 = sqrt(((10/9) + sqrt((100/81) - (20/21)))/2);

x3 = sqrt(((10/9) - sqrt((100/81) - (20/21)))/2);

legroots5 = [-x1 -x3 0 x3 x1];

w1 = 1/900\*(322 + 13\*sqrt(70));

w2 = 1/900\*(322 - 13\*sqrt(70));

weights = [w2 w1 128/225 w1 w2];

result = (b - a)/2 \* summat(1,5,@(k) weights(k) \* f((a+b)/2 + legroots5(k)\*(b-a)/2));

end

function l = linterp(i, t)

l = @(x)1;

[~,tcol] = size(t);

for y = 1:tcol

if y ~= i

l = @(x) ( ( l(x).\* (x-t(y)) / (t(i)-t(y)) ) );

end

end

end

function result = summat(a, b, f)

result = 0;

while a <= b

result = result + f(a);

a = a + 1;

end