Lab 11

import time

'''The main function of the program.'''

def main():

c = 0 #Final time variable

offset = 1000 #Offset variable

times = [] #List for time results

results = [] #List for results results

o = [] #List for range results

f = open("times.csv", "w")

'''Runs and times the recursive algorithm'''

for i in range(-offset, offset, 10):

o.append(i)

a = time.time()

results.append(solvie(i, offset))

b = time.time()

times.append(b - a)

'''Creates the CSV file.'''

f.write("%s, %s, %s\n"%("Iterations", "Results", "Times"))

for i in range(len(results)):

f.write("%f, %f, %f\n"%(o[i], results[i], times[i]))

f.close()

'''Creates a result list and calls the recursive function'''

def solvie(n, offset):

results = [None for i in range(offset \* 2)]

return h(n, results, offset)

'''Checks if result is saved to save time, otherwise calculates.'''

def h(n, results, offset):

if results[n + offset] != None:

return results[n + offset]

if n < -5:

results[n + offset] = h(n+4,results, offset) + h(n+2,results, offset)

return results[n + offset]

elif -5 <= n and n < 2:

results[n + offset] = n \* 2

return results[n + offset]

elif n >= 2:

results[n + offset] = h(n-8, results, offset) - h(n-4,results, offset) + h(n-3,results, offset)

return results[n + offset]

'''Calls main'''

if \_\_name\_\_ == '\_\_main\_\_':

main()

Output:

|  |  |  |
| --- | --- | --- |
| Iterations | Results | Times |
| -1000 | -9.0237E+104 | 0.000242 |
| -990 | -8.1366E+103 | 0.000163 |
| -980 | -7.3368E+102 | 0.000161 |
| -970 | -6.6156E+101 | 0.000158 |
| -960 | -5.9653E+100 | 0.000158 |
| -950 | -5.3789E+99 | 0.000157 |
| -940 | -4.85013E+98 | 0.000155 |
| -930 | -4.37336E+97 | 0.000155 |
| -920 | -3.94346E+96 | 0.000154 |
| -910 | -3.55581E+95 | 0.000151 |
| -900 | -3.20627E+94 | 0.000151 |
| -890 | -2.8911E+93 | 0.000149 |
| -880 | -2.6069E+92 | 0.000149 |
| -870 | -2.35064E+91 | 0.000147 |
| -860 | -2.11957E+90 | 0.000146 |
| -850 | -1.91122E+89 | 0.000144 |
| -840 | -1.72334E+88 | 0.000144 |
| -830 | -1.55394E+87 | 0.000142 |
| -820 | -1.40118E+86 | 0.000141 |
| -810 | -1.26345E+85 | 0.000139 |
| -800 | -1.13925E+84 | 0.000139 |
| -790 | -1.02726E+83 | 0.000136 |
| -780 | -9.2628E+81 | 0.000135 |
| -770 | -8.35226E+80 | 0.000133 |
| -760 | -7.53123E+79 | 0.000134 |
| -750 | -6.79091E+78 | 0.00013 |
| -740 | -6.12336E+77 | 0.000128 |
| -730 | -5.52143E+76 | 0.000126 |
| -720 | -4.97867E+75 | 0.000128 |
| -710 | -4.48926E+74 | 0.000128 |
| -700 | -4.04796E+73 | 0.000125 |
| -690 | -3.65005E+72 | 0.000121 |
| -680 | -3.29125E+71 | 0.000122 |
| -670 | -2.96771E+70 | 0.000118 |
| -660 | -2.67599E+69 | 0.000118 |
| -650 | -2.41294E+68 | 0.000117 |
| -640 | -2.17574E+67 | 0.000116 |
| -630 | -1.96187E+66 | 0.000113 |
| -620 | -1.76901E+65 | 0.000113 |
| -610 | -1.59512E+64 | 0.000111 |
| -600 | -1.43832E+63 | 0.00011 |
| -590 | -1.29693E+62 | 0.000108 |
| -580 | -1.16944E+61 | 0.000108 |
| -570 | -1.05448E+60 | 0.000106 |
| -560 | -9.50828E+58 | 0.000104 |
| -550 | -8.57361E+57 | 0.000103 |
| -540 | -7.73082E+56 | 0.000102 |
| -530 | -6.97088E+55 | 0.0001 |
| -520 | -6.28563E+54 | 0.000099 |
| -510 | -5.66775E+53 | 0.0001 |
| -500 | -5.11061E+52 | 0.000096 |
| -490 | -4.60823E+51 | 0.000095 |
| -480 | -4.15524E+50 | 0.000093 |
| -470 | -3.74678E+49 | 0.000092 |
| -460 | -3.37847E+48 | 0.000092 |
| -450 | -3.04636E+47 | 0.00009 |
| -440 | -2.7469E+46 | 0.000089 |
| -430 | -2.47688E+45 | 0.000086 |
| -420 | -2.2334E+44 | 0.000086 |
| -410 | -2.01386E+43 | 0.000084 |
| -400 | -1.81589E+42 | 0.000082 |
| -390 | -1.63739E+41 | 0.00008 |
| -380 | -1.47643E+40 | 0.000079 |
| -370 | -1.3313E+39 | 0.000078 |
| -360 | -1.20043E+38 | 0.000078 |
| -350 | -1.08243E+37 | 0.000076 |
| -340 | -9.76026E+35 | 0.000074 |
| -330 | -8.80082E+34 | 0.000073 |
| -320 | -7.9357E+33 | 0.000072 |
| -310 | -7.15561E+32 | 0.00007 |
| -300 | -6.45221E+31 | 0.000069 |
| -290 | -5.81796E+30 | 0.000068 |
| -280 | -5.24605E+29 | 0.000066 |
| -270 | -4.73036E+28 | 0.000065 |
| -260 | -4.26536E+27 | 0.000063 |
| -250 | -3.84607E+26 | 0.000062 |
| -240 | -3.468E+25 | 0.000061 |
| -230 | -3.1271E+24 | 0.000059 |
| -220 | -2.8197E+23 | 0.000058 |
| -210 | -2.54252E+22 | 0.000057 |
| -200 | -2.29259E+21 | 0.000055 |
| -190 | -2.06723E+20 | 0.000053 |
| -180 | -1.86402E+19 | 0.000053 |
| -170 | -1.68078E+18 | 0.000051 |
| -160 | -1.51556E+17 | 0.00005 |
| -150 | -1.36658E+16 | 0.000048 |
| -140 | -1.23225E+15 | 0.000047 |
| -130 | -1.11112E+14 | 0.000046 |
| -120 | -1.00189E+13 | 0.000044 |
| -110 | -9.03406E+11 | 0.000044 |
| -100 | -81460044296 | 0.000042 |
| -90 | -7345247612 | 0.000041 |
| -80 | -662320564 | 0.00004 |
| -70 | -59721408 | 0.000038 |
| -60 | -5385076 | 0.000037 |
| -50 | -485572 | 0.000035 |
| -40 | -43784 | 0.000035 |
| -30 | -3948 | 0.000033 |
| -20 | -356 | 0.000031 |
| -10 | -32 | 0.000031 |
| 0 | 0 | 0.000029 |
| 10 | -8 | 0.000033 |
| 20 | 152 | 0.000038 |
| 30 | -1564 | 0.00004 |
| 40 | 8830 | 0.000045 |
| 50 | -5206 | 0.000048 |
| 60 | -551872 | 0.000052 |
| 70 | 7437108 | 0.000056 |
| 80 | -56792548 | 0.000061 |
| 90 | 208551236 | 0.000064 |
| 100 | 1293730820 | 0.000068 |
| 110 | -31154567770 | 0.000071 |
| 120 | 3.09028E+11 | 0.000076 |
| 130 | -1.78539E+12 | 0.000079 |
| 140 | 1.30105E+12 | 0.000083 |
| 150 | 1.08043E+14 | 0.000088 |
| 160 | -1.47601E+15 | 0.000091 |
| 170 | 1.1375E+16 | 0.000094 |
| 180 | -4.27184E+16 | 0.000103 |
| 190 | -2.46973E+17 | 0.000103 |
| 200 | 6.1504E+18 | 0.000107 |
| 210 | -6.15959E+19 | 0.00011 |
| 220 | 3.60015E+20 | 0.000114 |
| 230 | -3.12499E+20 | 0.000119 |
| 240 | -2.11434E+22 | 0.000122 |
| 250 | 2.9289E+23 | 0.000126 |
| 260 | -2.27786E+24 | 0.000131 |
| 270 | 8.74188E+24 | 0.000135 |
| 280 | 4.70535E+25 | 0.000139 |
| 290 | -1.21391E+27 | 0.000143 |
| 300 | 1.22755E+28 | 0.000149 |
| 310 | -7.25718E+28 | 0.000155 |
| 320 | 7.28469E+28 | 0.000157 |
| 330 | 4.13577E+30 | 0.000161 |
| 340 | -5.81098E+31 | 0.00017 |
| 350 | 4.5606E+32 | 0.000171 |
| 360 | -1.78733E+33 | 0.000218 |
| 370 | -8.94531E+33 | 0.000185 |
| 380 | 2.39538E+35 | 0.000182 |
| 390 | -2.446E+36 | 0.000185 |
| 400 | 1.46245E+37 | 0.000189 |
| 410 | -1.66165E+37 | 0.000193 |
| 420 | -8.08604E+38 | 0.000197 |
| 430 | 1.15272E+40 | 0.000204 |
| 440 | -9.12924E+40 | 0.000205 |
| 450 | 3.65121E+41 | 0.000208 |
| 460 | 1.69656E+42 | 0.000214 |
| 470 | -4.72564E+43 | 0.000217 |
| 480 | 4.87314E+44 | 0.000221 |
| 490 | -2.94621E+45 | 0.000226 |
| 500 | 3.72826E+45 | 0.000232 |
| 510 | 1.58018E+47 | 0.000235 |
| 520 | -2.28625E+48 | 0.00024 |
| 530 | 1.82712E+49 | 0.000244 |
| 540 | -7.45277E+49 | 0.000249 |
| 550 | -3.20926E+50 | 0.000253 |
| 560 | 9.32061E+51 | 0.000257 |
| 570 | -9.7072E+52 | 0.000262 |
| 580 | 5.9336E+53 | 0.000265 |
| 590 | -8.25739E+53 | 0.000268 |
| 600 | -3.08644E+55 | 0.000273 |
| 610 | 4.53369E+56 | 0.000277 |
| 620 | -3.65612E+57 | 0.000282 |
| 630 | 1.52007E+58 | 0.000288 |
| 640 | 6.0532E+58 | 0.000304 |
| 650 | -1.83791E+60 | 0.000304 |
| 660 | 1.93336E+61 | 0.00031 |
| 670 | -1.19467E+62 | 0.000311 |
| 680 | 1.80984E+62 | 0.000308 |
| 690 | 6.02539E+63 | 0.000311 |
| 700 | -8.9889E+64 | 0.000317 |
| 710 | 7.31469E+65 | 0.000319 |
| 720 | -3.09809E+66 | 0.000324 |
| 730 | -1.13806E+67 | 0.000329 |
| 740 | 3.62325E+68 | 0.000332 |
| 750 | -3.85002E+69 | 0.000337 |
| 760 | 2.40466E+70 | 0.000341 |
| 770 | -3.93275E+70 | 0.000345 |
| 780 | -1.17565E+72 | 0.00035 |
| 790 | 1.78192E+73 | 0.00036 |
| 800 | -1.46316E+74 | 0.000358 |
| 810 | 6.30988E+74 | 0.000363 |
| 820 | 2.13194E+75 | 0.000367 |
| 830 | -7.14107E+76 | 0.00037 |
| 840 | 7.66561E+77 | 0.000381 |
| 850 | -4.83882E+78 | 0.000377 |
| 860 | 8.48429E+78 | 0.000382 |
| 870 | 2.29258E+80 | 0.000386 |
| 880 | -3.53179E+81 | 0.00039 |
| 890 | 2.92626E+82 | 0.000394 |
| 900 | -1.28428E+83 | 0.000399 |
| 910 | -3.9775E+83 | 0.000405 |
| 920 | 1.40708E+85 | 0.000414 |
| 930 | -1.52603E+86 | 0.000412 |
| 940 | 9.7344E+86 | 0.000418 |
| 950 | -1.81914E+87 | 0.000434 |
| 960 | -4.46804E+88 | 0.000439 |
| 970 | 6.99887E+89 | 0.000462 |
| 980 | -5.85136E+90 | 0.00046 |
| 990 | 2.61228E+91 | 0.00046 |

Chart: