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Blackbox Summary

Function 1:

<u>Testing Details:</u>

I began with n = 100 and added 100 ten times to it.

<u>Big O:</u>

$O(n^3)$

Based on the graph at the end of the document, and on the fact that the standard error was 0.2973%, I can conclude that this is the big o.

<u>Gnuplot Details:</u>

Final set of parameters   Asymptotic Standard Error
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c   = 0.00226147   +/- 6.724e-06   (0.2973%)

Function 2:

<u>Testing Details:</u>

Used n from 10 to 30, incrementing by one.

<u>Big O:</u>

$O(2^n)$

Based on the graph at the end of the document, and on the fact that the standard error was 0.212%, I can conclude that this is the big o.

<u>Gnuplot Details:</u>

Final set of parameters   Asymptotic Standard Error
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c   = 0.00440304   +/- 9.334e-06(0.212%)

Function 3:

Shuffled List:
    Testing Details:
    Started n at 100000 and added 100000 ten times.

    Big O:
        O(n)
    Based on the graph at the end of the document, and on the fact that the
    Standard error was 1.294%, I can assume that this is the big o.

    Gnuplot Details:

    After 3 iterations the fit converged.
    final sum of squares of residuals : 1.26246e+08
    rel. change during last iteration : -4.23758e-06

    degrees of freedom (FIT_NDF)   : 9
    rms of residuals   (FIT_STDFIT) = sqrt(WSSR/ndf) : 3745.3
    variance of residuals (reduced chisquare) = WSSR/ndf : 1.40273e+07

    Final set of parameters   Asymptotic Standard Error
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    c   = 0.147527   +/- 0.001909 (1.294%)

Reverse Sorted List:
    Testing Details:
        Started at n = 10 and multiplied by 10 seven times
    Big O:
        O(n)
        Based on the graph at the end of the document, and on the fact that the
        Standard error was 0.57%, I can assume that this is the big o.
    Gnuplot Details:

After 3 iterations the fit converged.
final sum of squares of residuals : 3.68106e+07
rel. change during last iteration : -3.70976e-06

degrees of freedom (FIT_NDF)   : 6
rms of residuals   (FIT_STDFIT) = sqrt(WSSR/ndf) : 2476.91
variance of residuals (reduced chisquare) = WSSR/ndf   : 6.13511e+06

Final set of parameters   Asymptotic Standard Error
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c   = 0.0429129   +/- 0.0002464   (0.5743%)

Sorted List:
Testing Details:
       Started at n = 10 and multiplied by 10 seven times
Big O:
       O(n)
Based on the graph at the end of the document, and on the fact that the
Standard error was 0.6467%, I can assume that this is the big o.

Gnuplot Details:
After 4 iterations the fit converged.
final sum of squares of residuals : 8.84994e+08
rel. change during last iteration : -1.4413e-14

degrees of freedom (FIT_NDF)   : 6
rms of residuals   (FIT_STDFIT) = sqrt(WSSR/ndf) : 12144.9
variance of residuals (reduced chisquare) = WSSR/ndf   : 1.47499e+08

Final set of parameters   Asymptotic Standard Error
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c   = 0.186867   +/- 0.001208 (0.6467%)

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Analysis:

The reverse sorted list appears to be the best case. Using the same n and incrementation, the average time for the 7th run was higher on the sorted list than the reverse list. I ran them both up to the 7th run 5 times and came to an average runtime of 1828196 ticks for the sorted list and 428535 ticks for the reverse list.

Overall though, the big O of the algorithm is O(n) for all cases.

Function 4:
<u>*Testing Details:*</u>
Used n = 10 and multiplied by ten 8 times

<u>*Big O:*</u>
O(nlog(n))
Based on the graph at the end of the document, and on the fact that the standard error was 0.8643%, I can conclude that this is the big o.

<u>*Gnuplot Details:*</u>

After 4 iterations the fit converged.
final sum of squares of residuals : 2.35912e+11
rel. change during last iteration : -1.73872e-12

degrees of freedom (FIT_NDF)   : 7
rms of residuals   (FIT_STDFIT) = sqrt(WSSR/ndf) : 183580
variance of residuals (reduced chisquare) = WSSR/ndf   : 3.37018e+10

Final set of parameters   Asymptotic Standard Error
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c   = 0.0114867   +/- 9.928e-05(0.8643%)

Function 5:

Testing Details:

Used n = 1000000 and increased by a factor of 10, ten times.

Big O:

O(log(n))

Based on the graph at the end of the document, and on the fact that the standard error was 0.689%, I can conclude that this is the big o.

Gnuplot Details:

Final set of parameters	Asymptotic Standard Error
=====================	=========================
c = 2855.03	+/- 19.67 (0.689%)

Function 6:

Sorted List:

Testing Details:

Started at n = 10 and multiplied by 10 twenty times.

Big O:

$O(n^2 log(n))$

Based on the graph at the end of the document, and on the fact that the Standard error was 1.086%, I can assume that this is the big o.

Gnuplot Details:

After 3 iterations the fit converged.
final sum of squares of residuals : 5.02417e+09
rel. change during last iteration : -2.52745e-07

degrees of freedom (FIT_NDF)   : 19
rms of residuals   (FIT_STDFIT) = sqrt(WSSR/ndf) : 16261.3
variance of residuals (reduced chisquare) = WSSR/ndf   : 2.6443e+08

Final set of parameters	Asymptotic Standard Error
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c   = 0.000205977   +/- 2.237e-06(1.086%)

Reverse Sorted List:

Testing Details:

Started at n = 10 and multiplied by 10 one thousand times to see if the function was linear since smaller sample sizes made it seem like it was O(1).

Big O:

O(n)

Based on the graph at the end of the document, and on the fact that the Standard error was 1.315%, I can assume that this is the big o.

Gnuplot Details:

After 1 iterations the fit converged.
final sum of squares of residuals : 8.67934e+08
rel. change during last iteration : -1.37348e-16

degrees of freedom (FIT_NDF)   : 999
rms of residuals   (FIT_STDFIT) = sqrt(WSSR/ndf) : 932.096
variance of residuals (reduced chisquare) = WSSR/ndf   : 868803

Final set of parameters   Asymptotic Standard Error
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c   = 0.00388419   +/- 5.109e-05(1.315%)

Shuffle List:

Testing Details:

Started at n = 10 and multiplied by 10 ten times.

Big O:

$O(n^2log(n))$

Based on the graph at the end of the document, and on the fact that the Standard error was 1.22%, I can assume that this is the big o.

Gnuplot Details:

After 1 iterations the fit converged.

final sum of squares of residuals : 2.40524e+08

rel. change during last iteration : -1.48687e-15

degrees of freedom (FIT_NDF)   : 9

rms of residuals   (FIT_STDFIT) = sqrt(WSSR/ndf)   : 5169.61

variance of residuals (reduced chisquare) = WSSR/ndf   : 2.67248e+07

Final set of parameters   Asymptotic Standard Error

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c   = 0.000381069   +/- 4.648e-06(1.22%)

Analysis:

The best case of this function would be when the data is reverse sorted, with a big o of $O(n)$. The worst case is when its regularly sorted, with a big o of $O(n^2\log(n))$. The average case, with the shuffled list, also has a big o of $O(n^2\log(n))$.

Function 7:

Testing Details:

Used n = 1 to 10, incrementing by one.

Big O:

$O(n!)$

Based on the graph at the end of the document, and on the fact that the standard error was only 0.18%, I can conclude that this is the big o.

Gnuplot Details:

After 4 iterations the fit converged.

final sum of squares of residuals : 125907

rel. change during last iteration : -2.14628e-07

degrees of freedom (FIT_NDF)   : 9

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rms of residuals   (FIT_STDFIT) = sqrt(WSSR/ndf) : 118.278
variance of residuals (reduced chisquare) = WSSR/ndf   : 13989.7

Final set of parameters   Asymptotic Standard Error
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c   = 0.0177303   +/- 3.243e-05(0.1829%)