# Tournament Size Experiments

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## Summary

In this document we show two plots for the GAModel and the GABBOB - a simple GA applied to the BBOB benchmark funtions - with tournize size (k) from 2 to 25, with the Uniform crossover operator (with 0.1 of independent probability of exchanging an gene) and Gaussian mutation operator with mu=0, sigma=1, 0.1 of independent probability.

Every plot it was calculated the mean, the standart deviation (std) and the confidence interval (C.I) of 40 runs of a configuration. Aa example of a configuration, giben by: evaluation function, tournament size, is GABBOB F1 with k = 2. For each configuration two plots are given. One, with the mean and the standart deviation and the other, with the mean and the CI. The graph shows the values of the mean minus and plus the std, whereas in the second plot, the graph shows mean and the CI, though the valeus are independent.

1. Number of generations: 500 (used to be 100).
2. Population size: 800 (used to be 500).

## Comments

We did some experiments with 40 dimensions, now we are experimenting with 20 dimensions.

Standart Deviation: F20 (For k = 1. . . 25) -> 0.3577385 1.4522482 0.3722891 0.3342789 0.3203987 0.3432203 0.3179952 0.3193463 15.7308372 0.2495824 0.4440507 0.6733610 1.7549915 9.6024268 10.8827583 0.2660707 0.3039624 0.2499267 0.3054992 0.2952024 2.2356739 0.4414154 0.2572610 0.3786557

## More information

With more dimensions the harder it is for a GA to find precise solutions. I got the idea from Sawyerr et al (Check next paragraph), although they use a much more complex GA (a hybrid one).

Sawyerr et al concluded that the RCGAu has excelled in solving the f1, f2, f3, f7 and f21, tough for the other functions it achieved avarage results. They also state that real value GA do not efficiently solve highly conditioned problems and studies have currently been carried out to find out why [1].
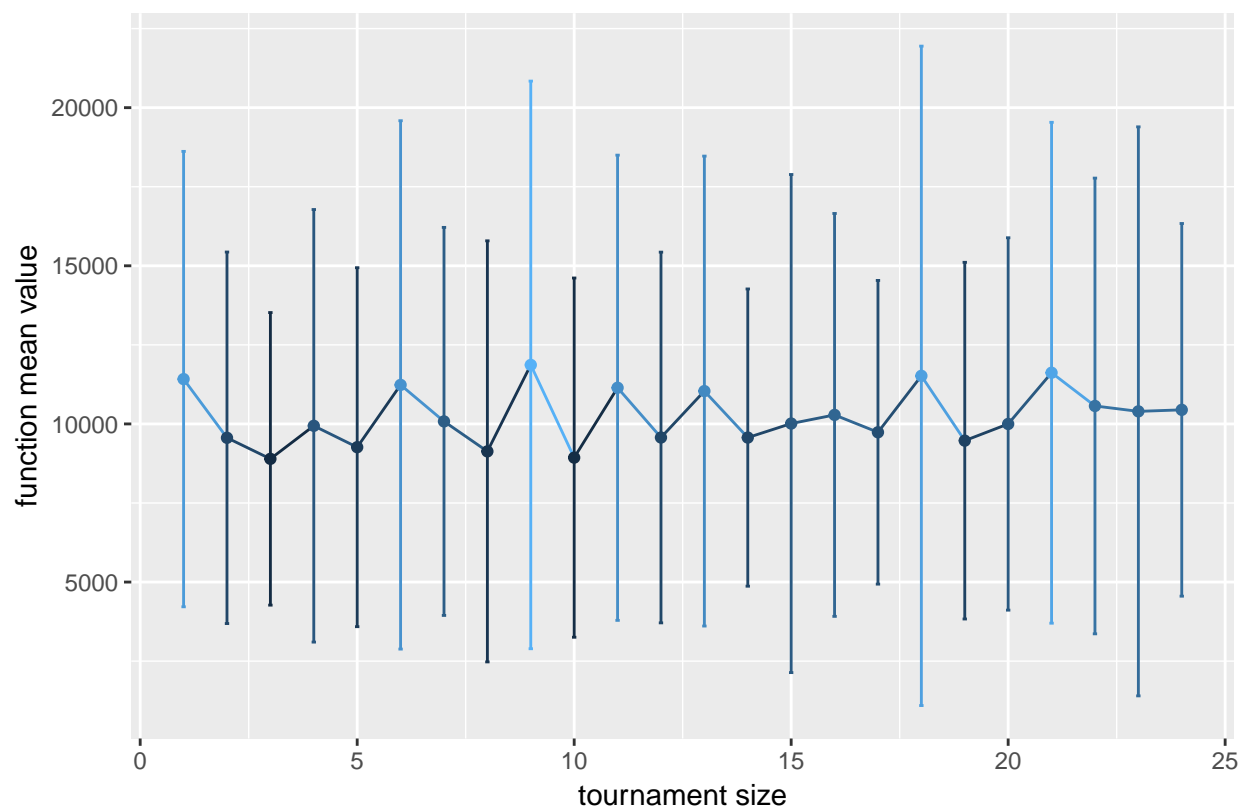
[1] Sawyerr, B.A., Adewumi, A.O., Ali, M.M.: Benchmarking rcgau on the noiseless bbob testbed. The Scientific World Journal 2015 (2015).
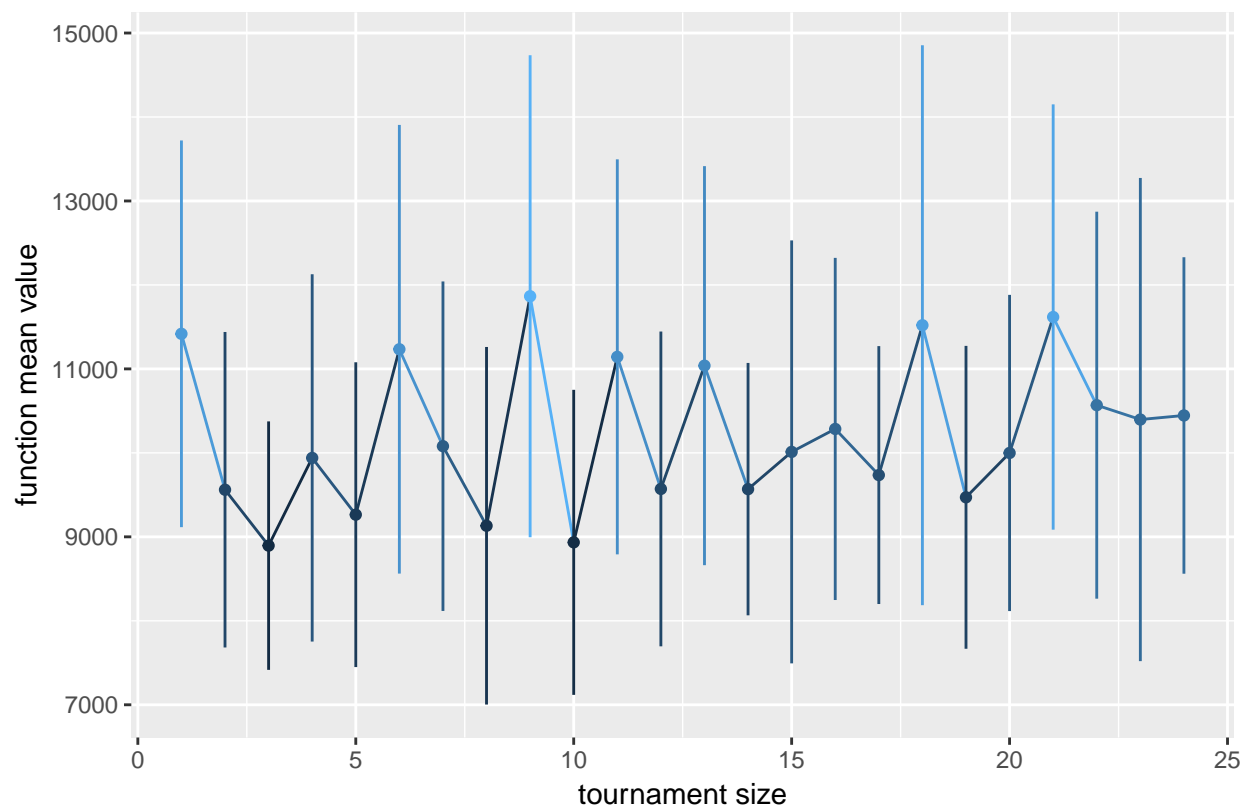
## Plots

The order of the plots is: first we show the GAModel plots and the the BBOB benchmark functions, from F1 to F24.
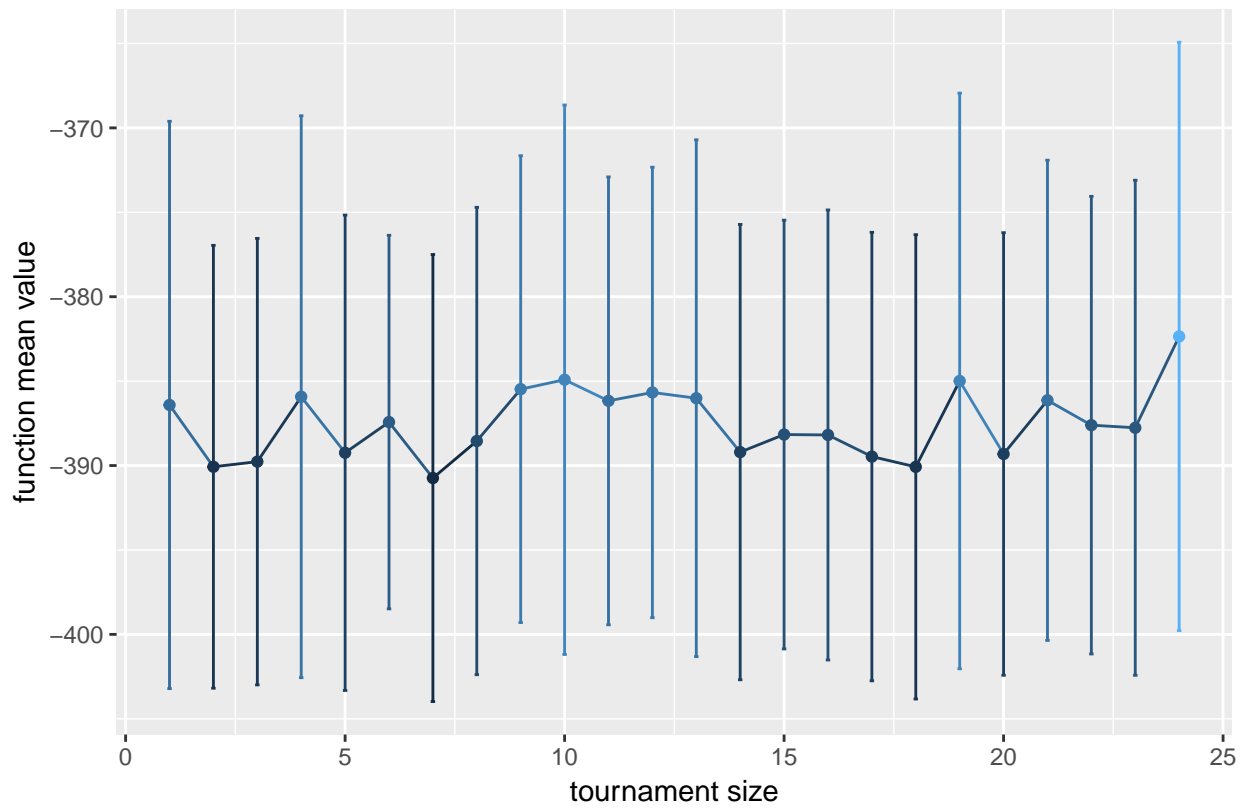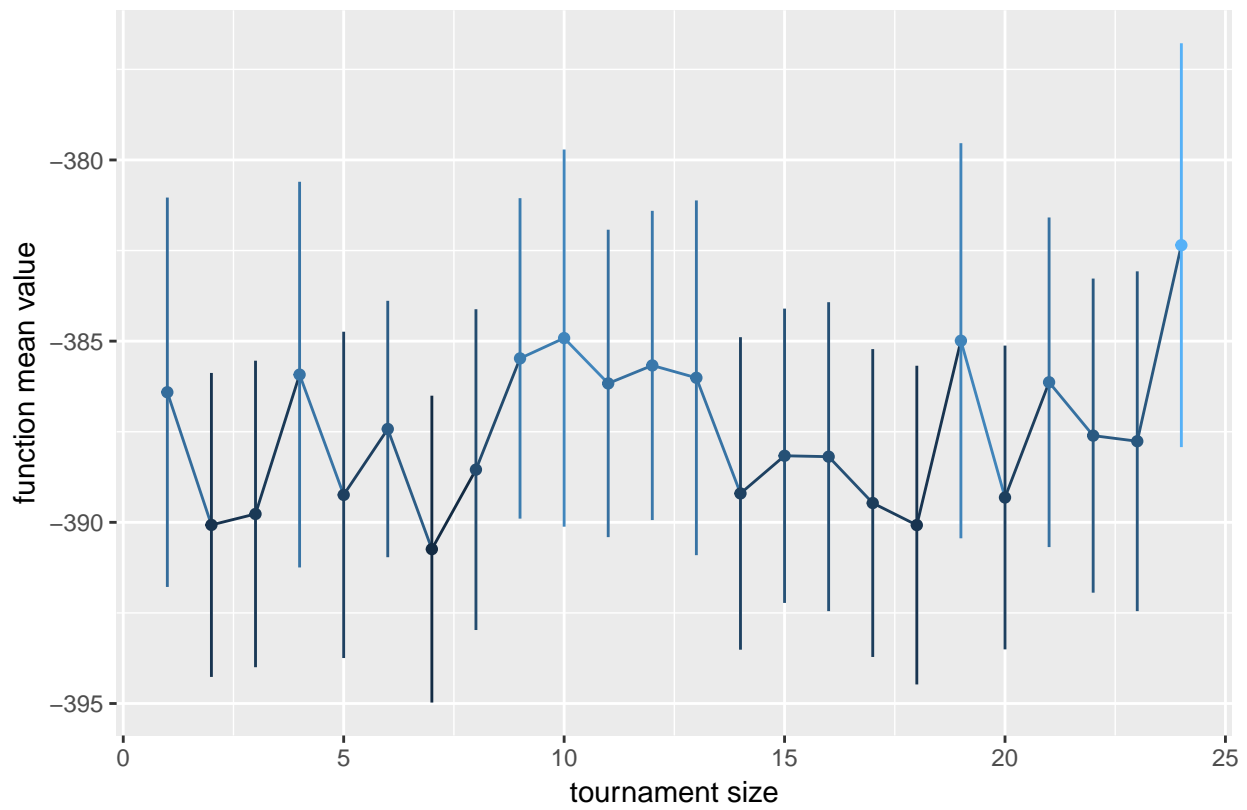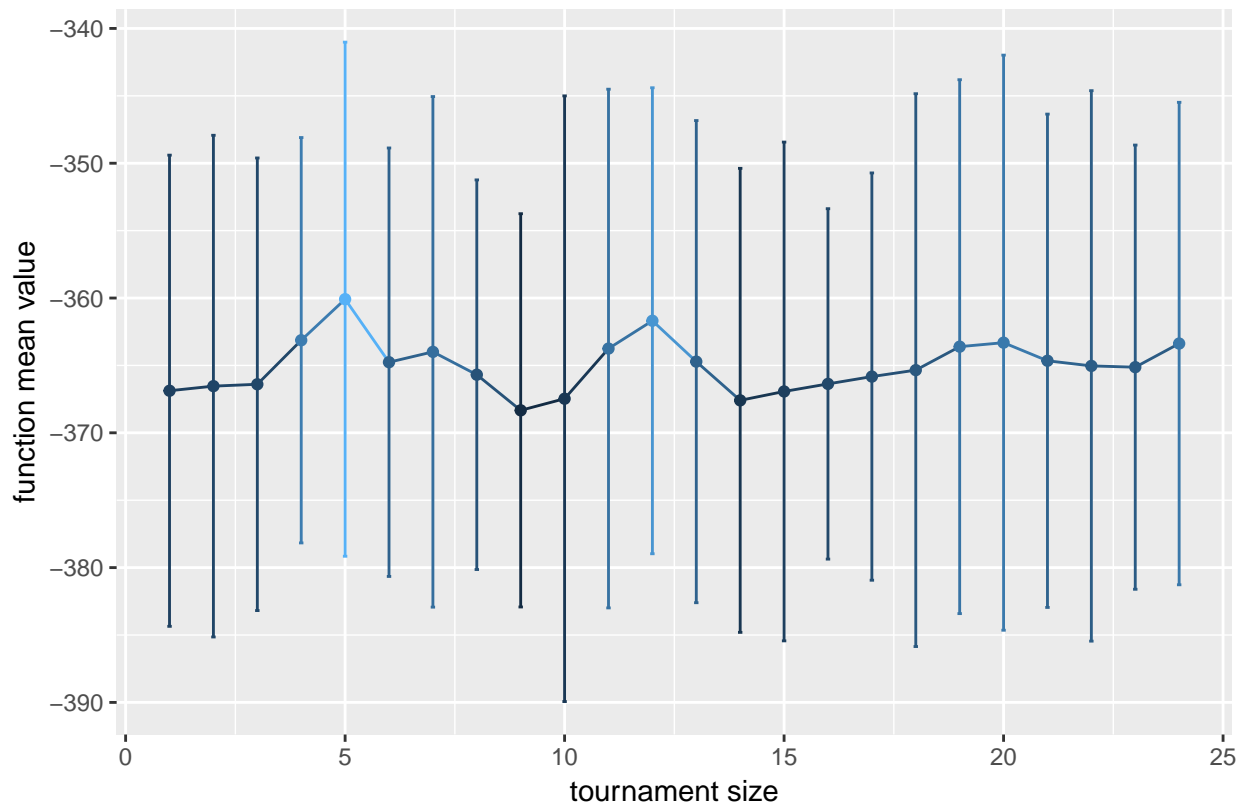
F1 means and std
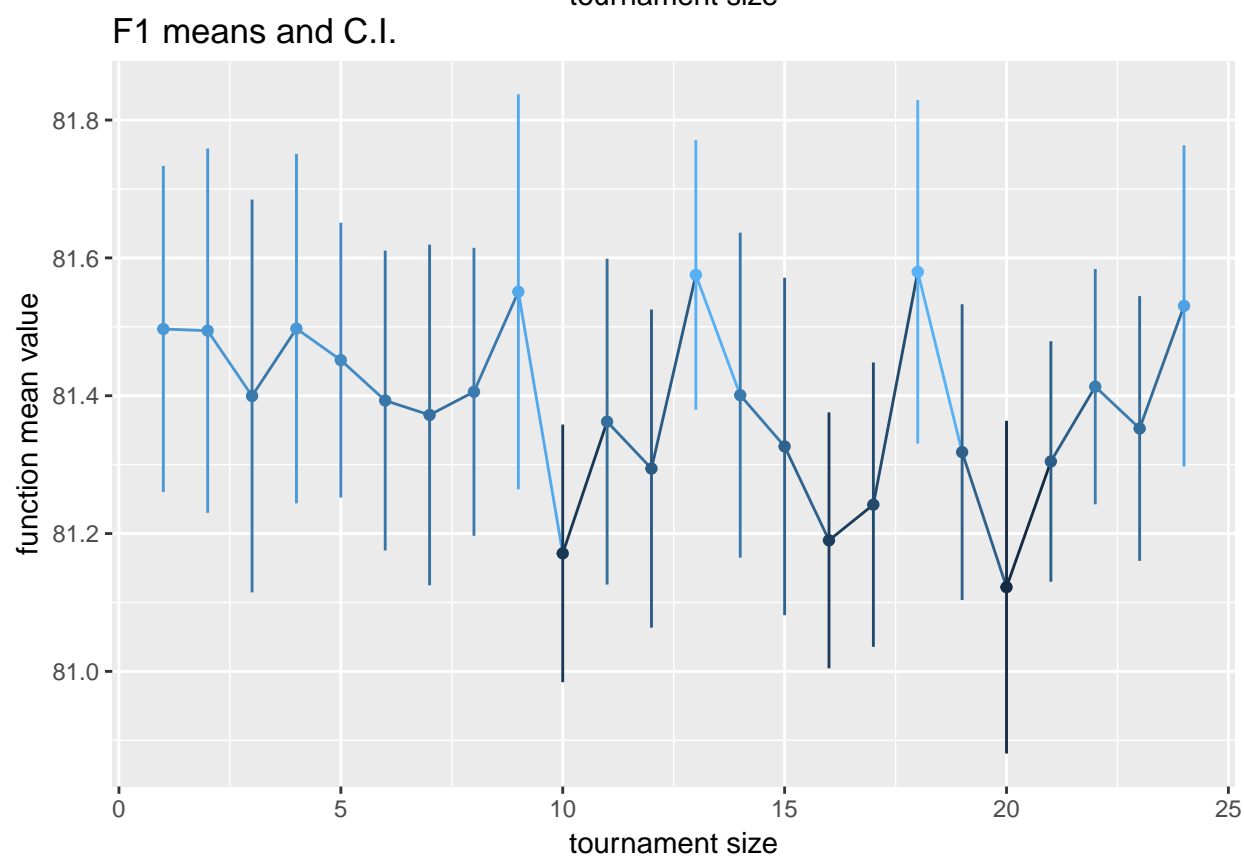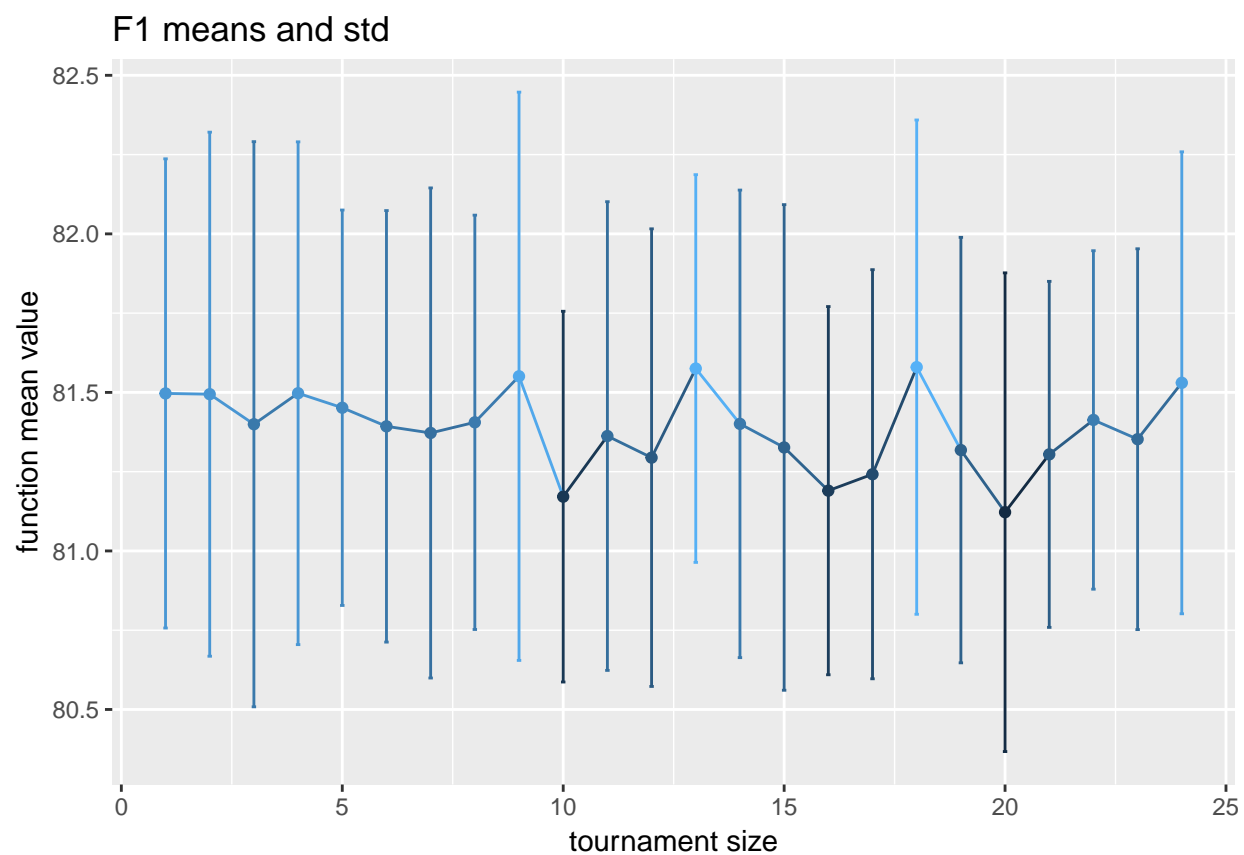
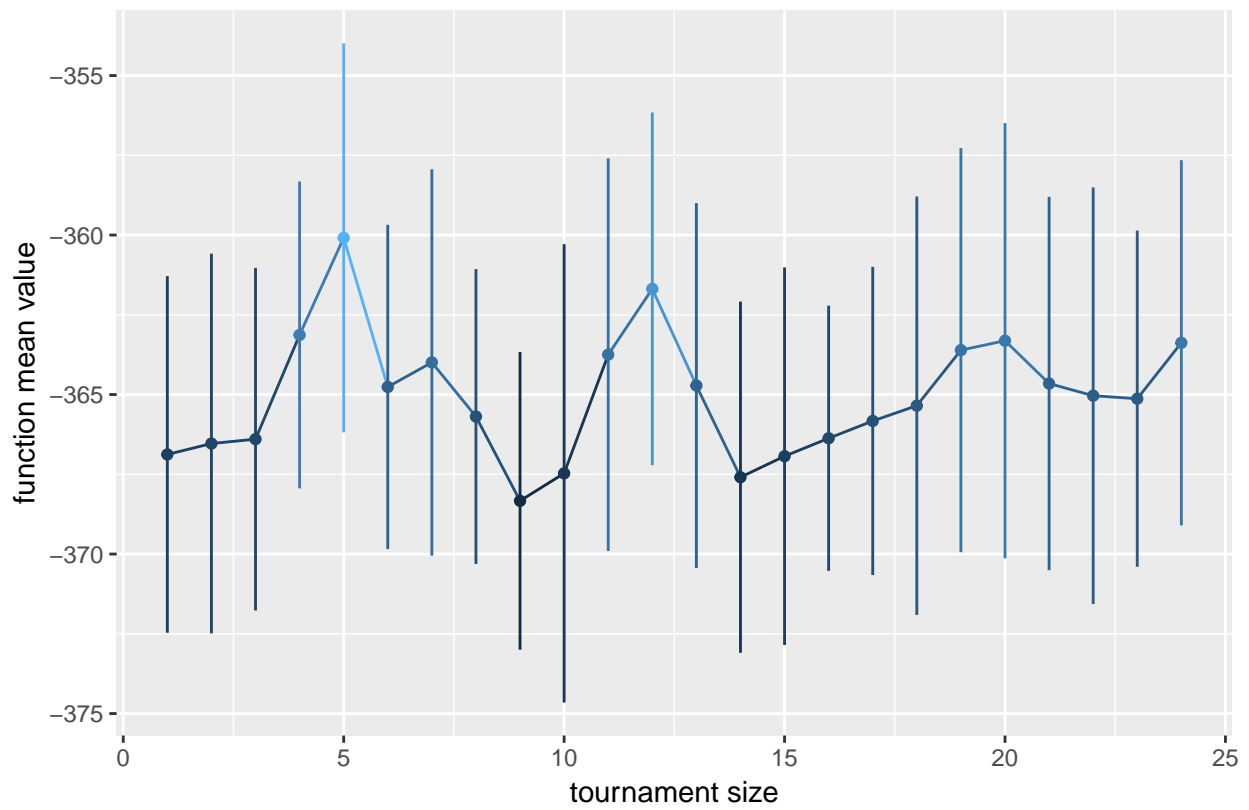F1 means and C.I.

## F2 means and std
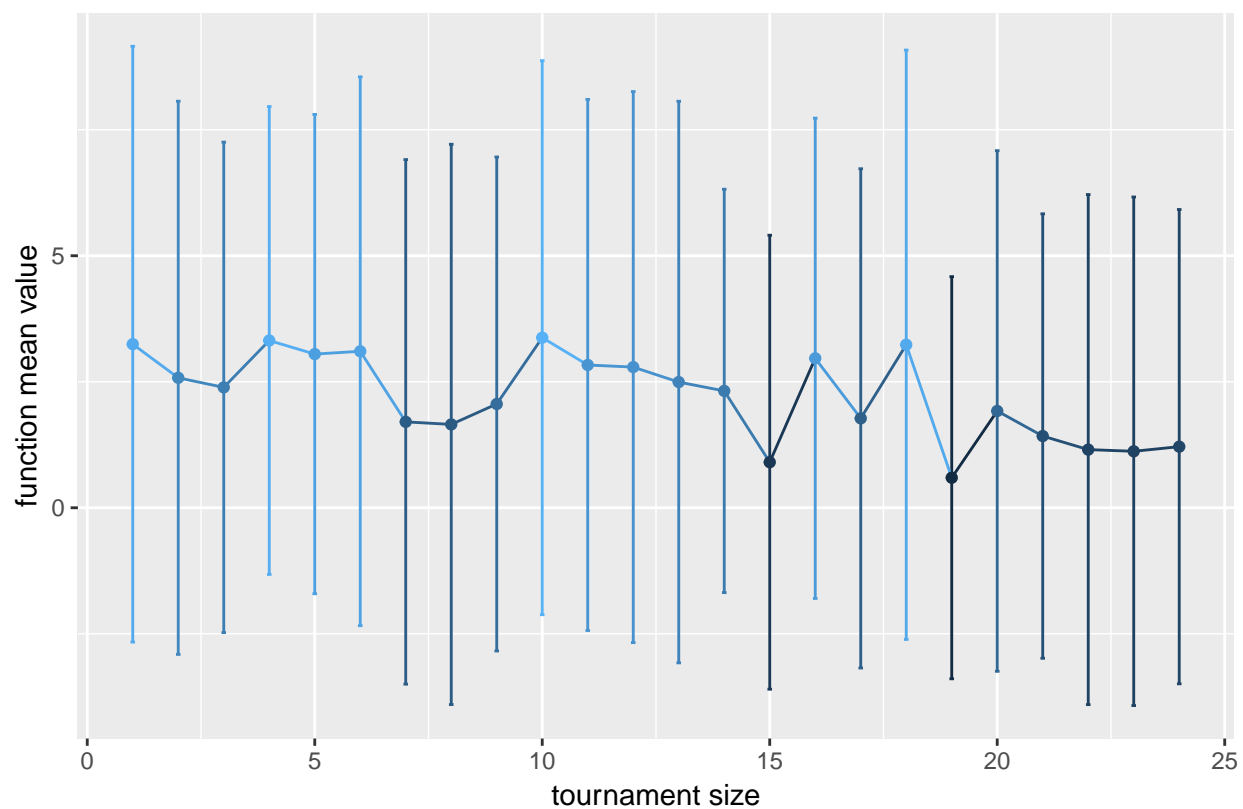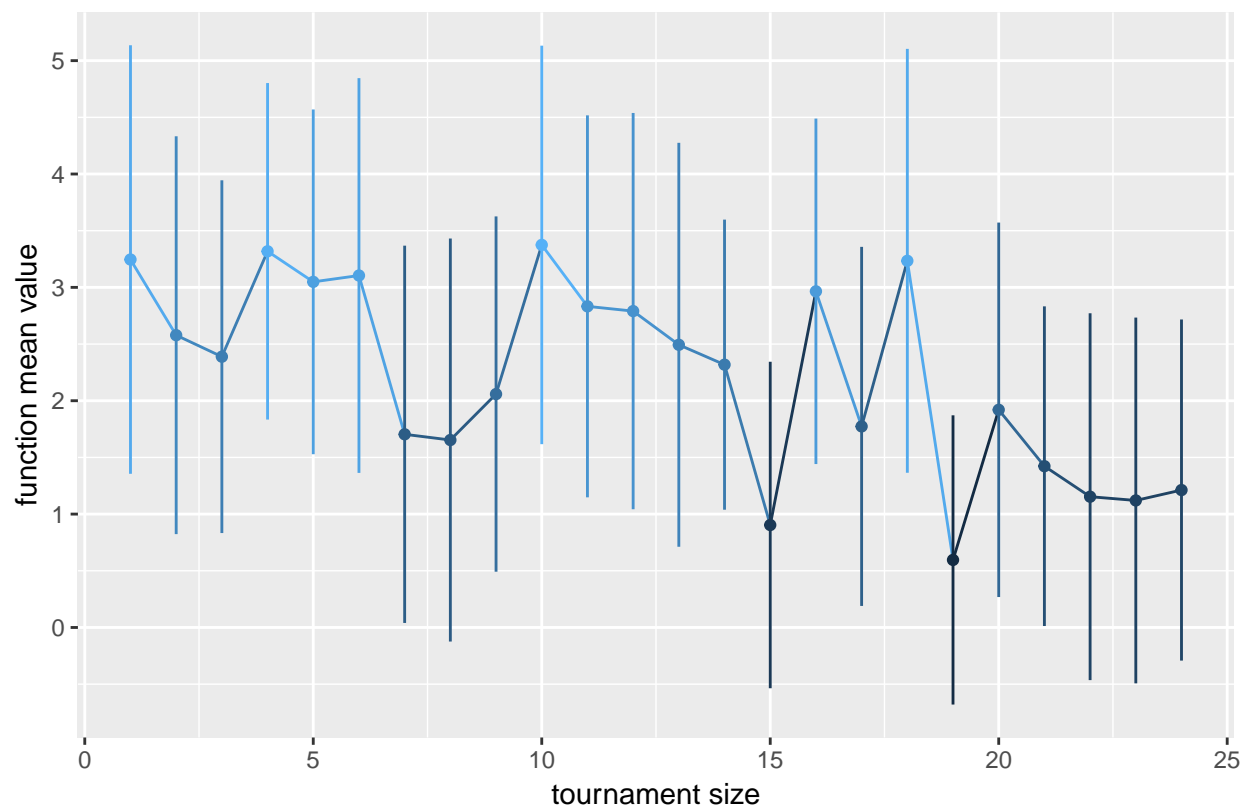


## F2 means and C.I.

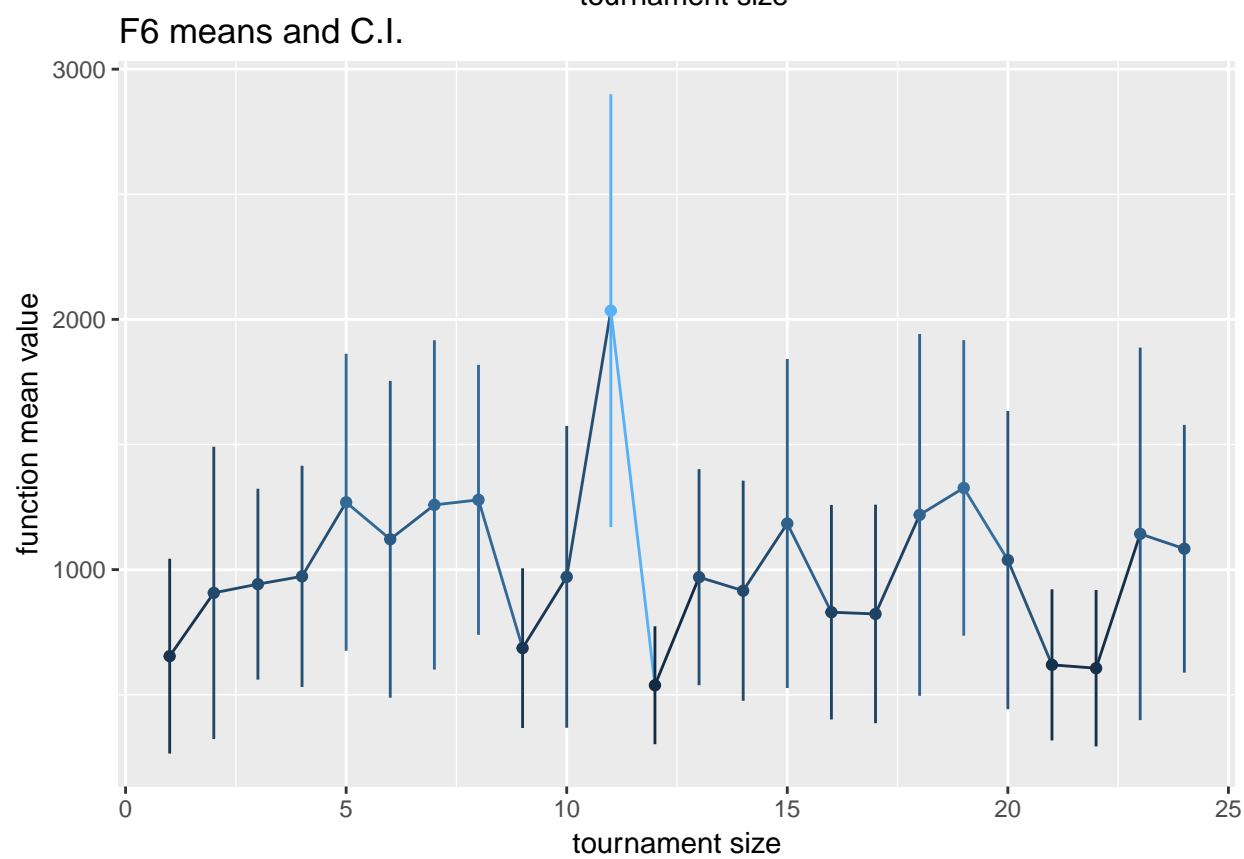F3 means and std
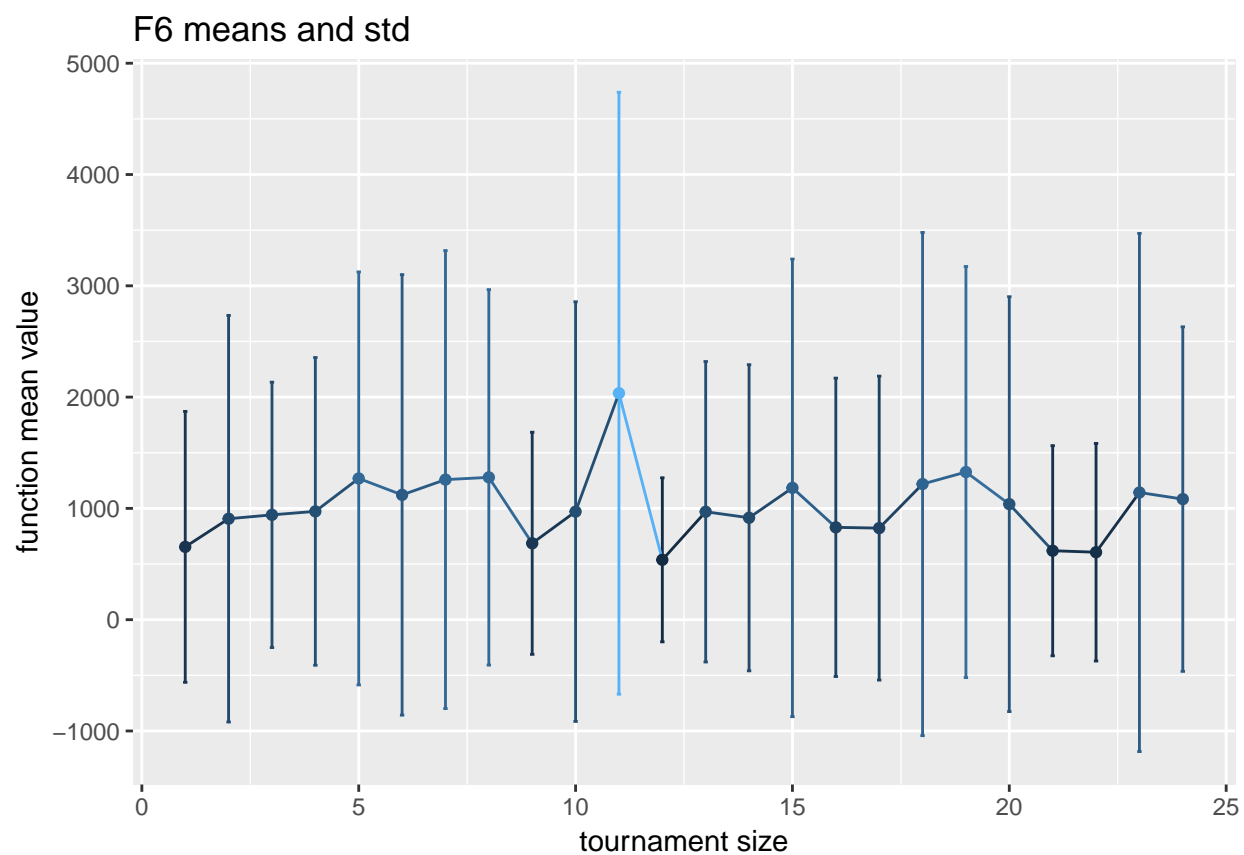
F3 means and C.I.

F4 means and std

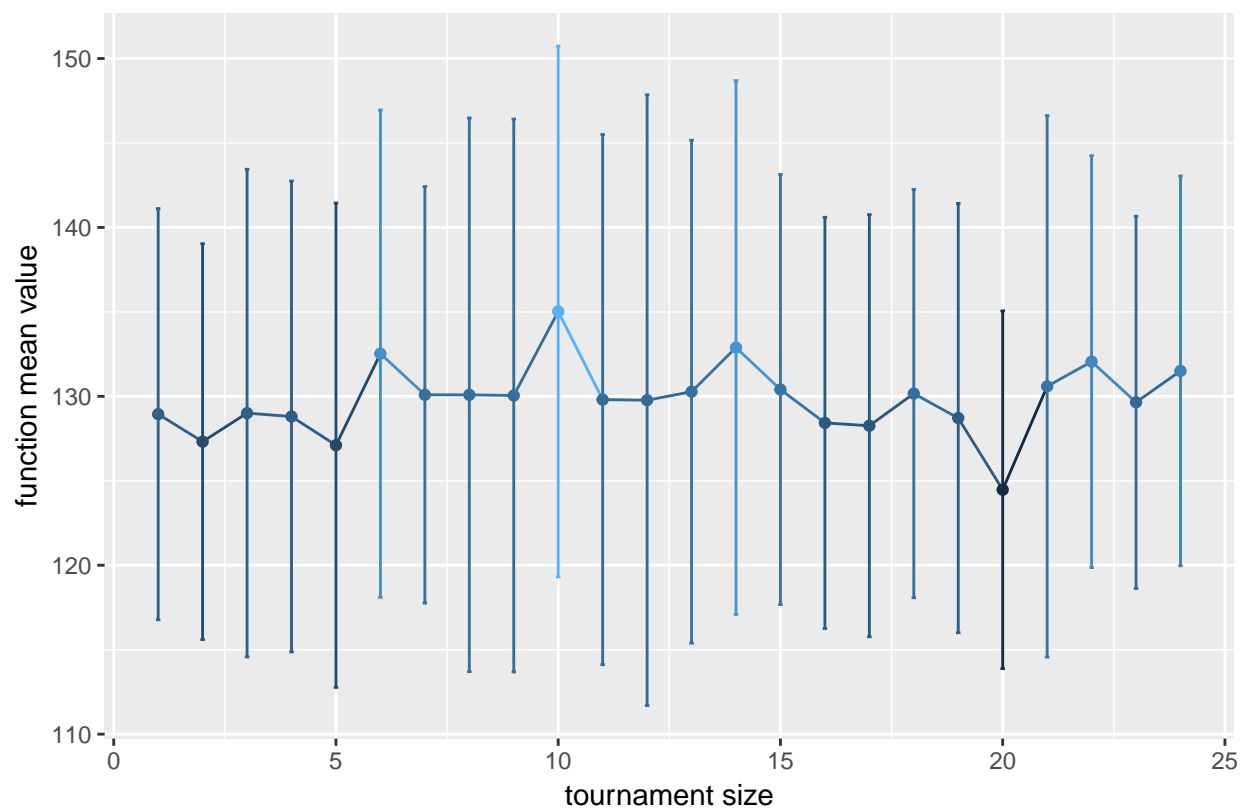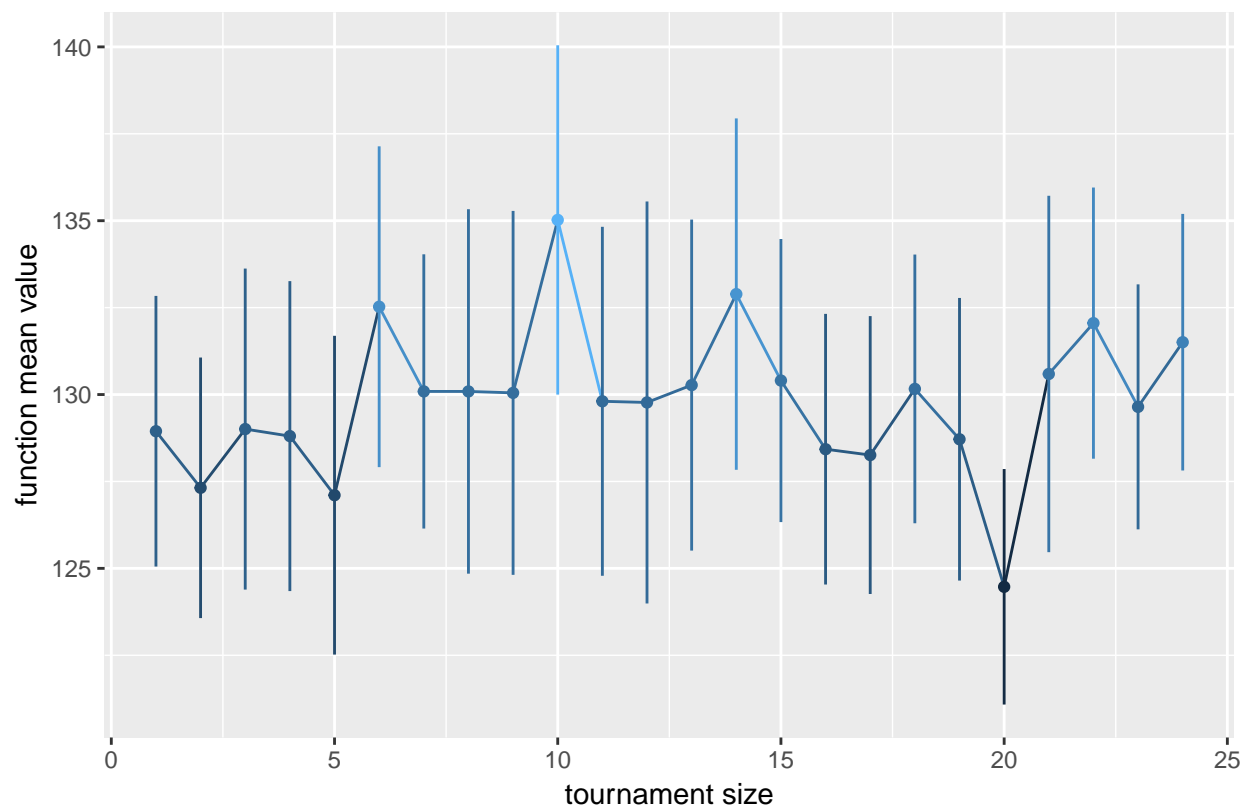F4 means and C.I.

F5 means and std
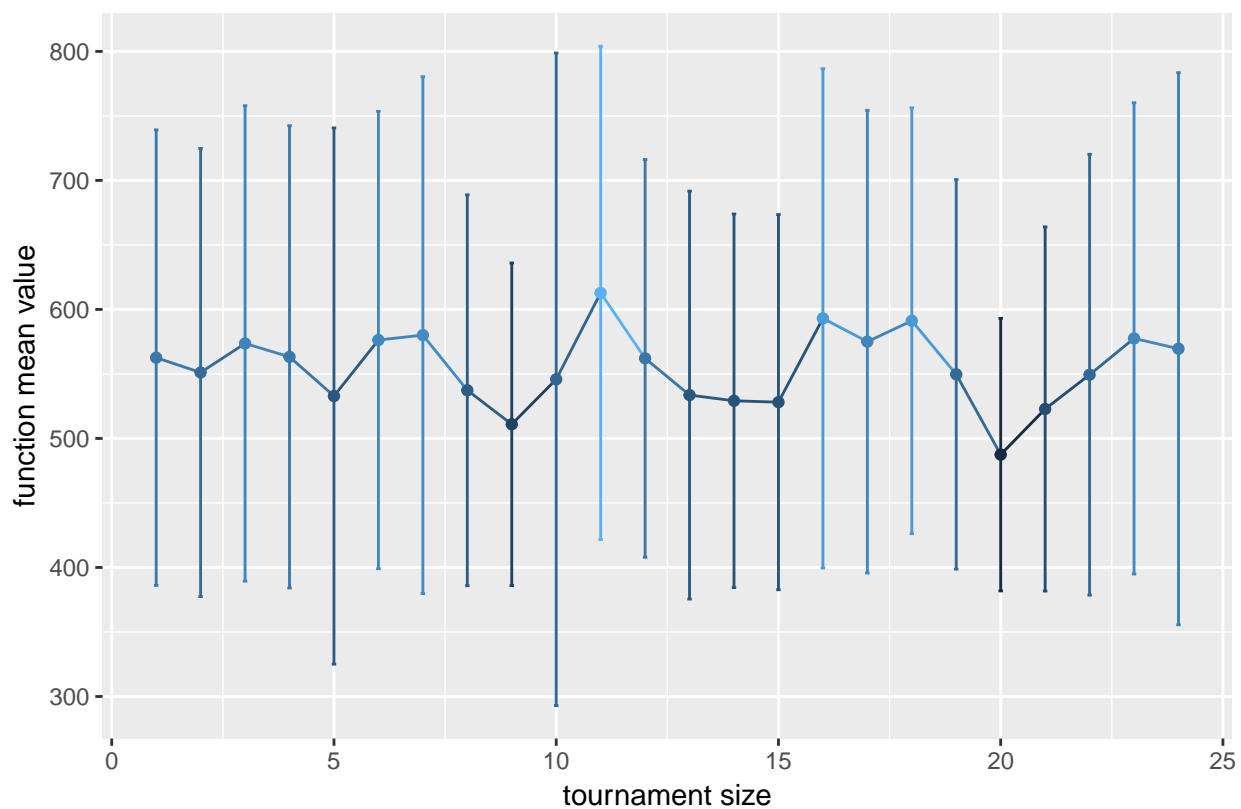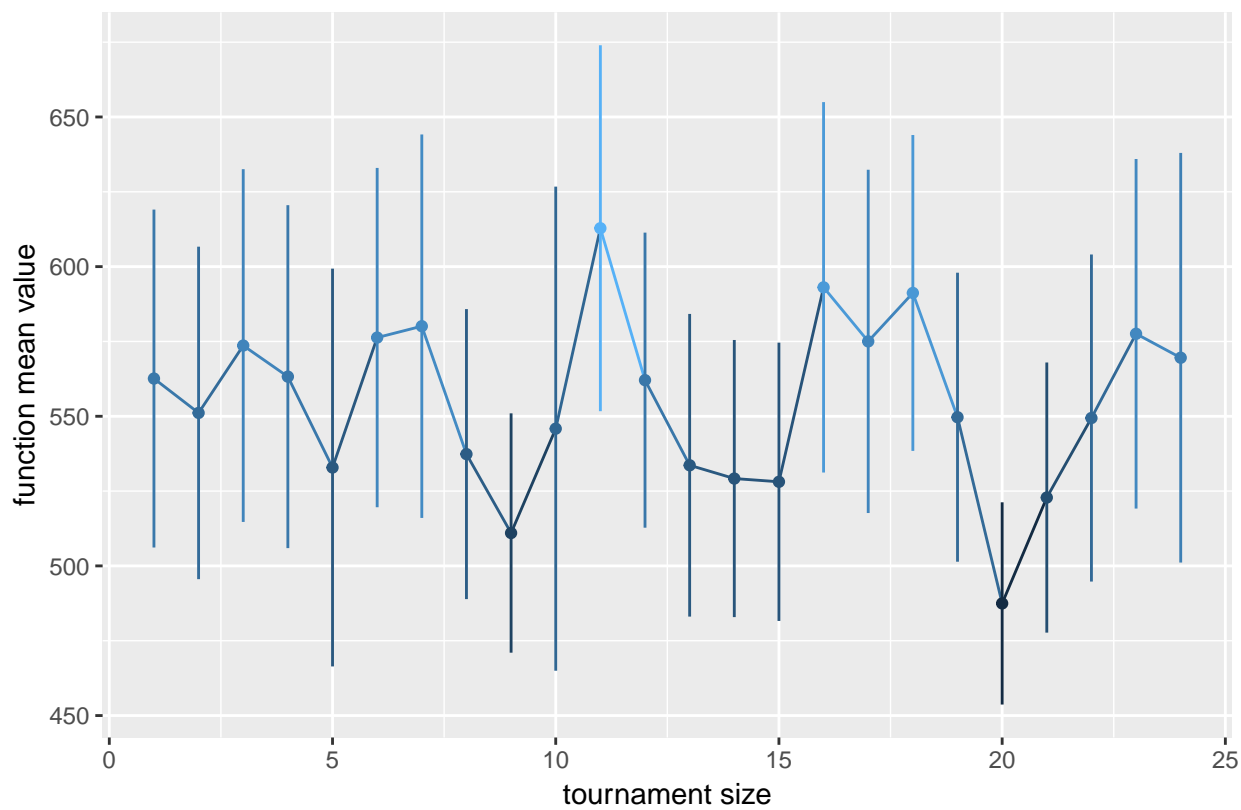
F5 means and C.I.

F6 means and std



F6 means and C.I.
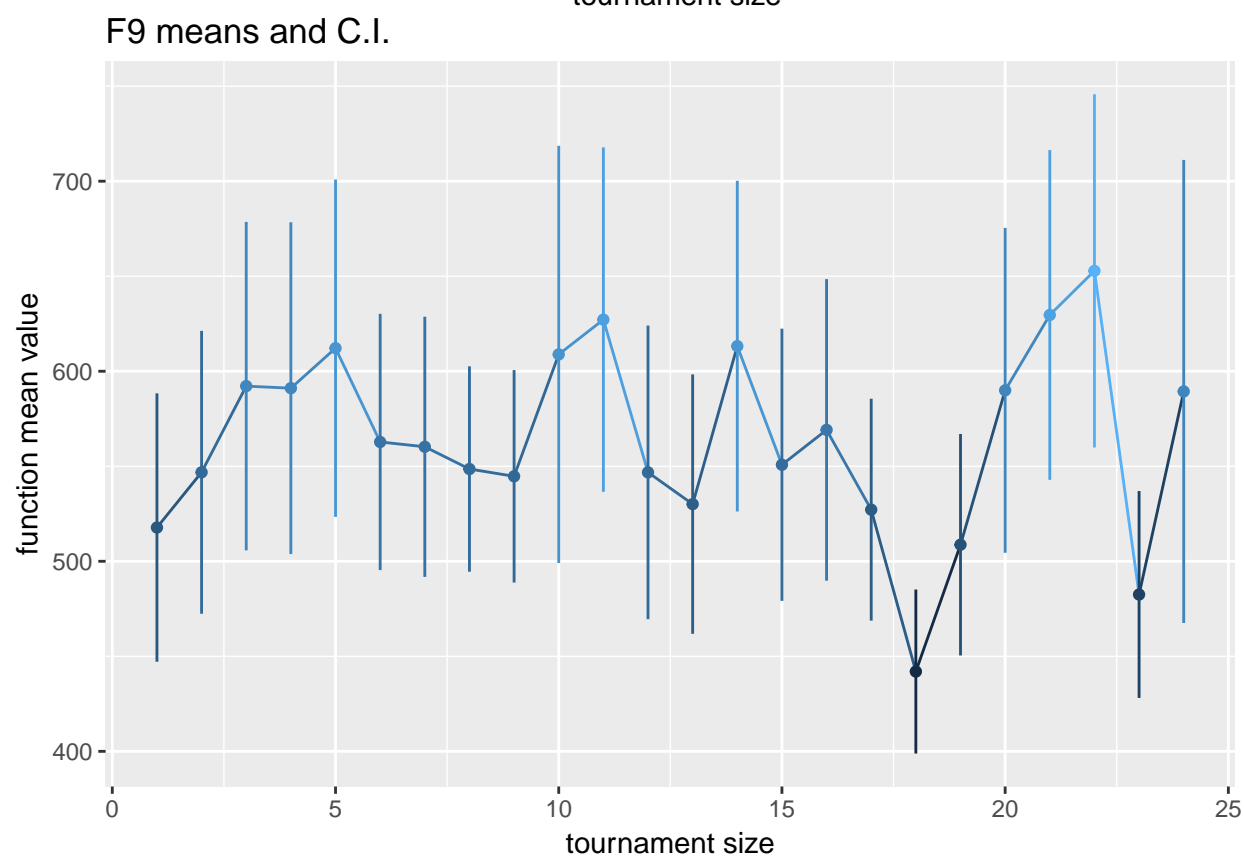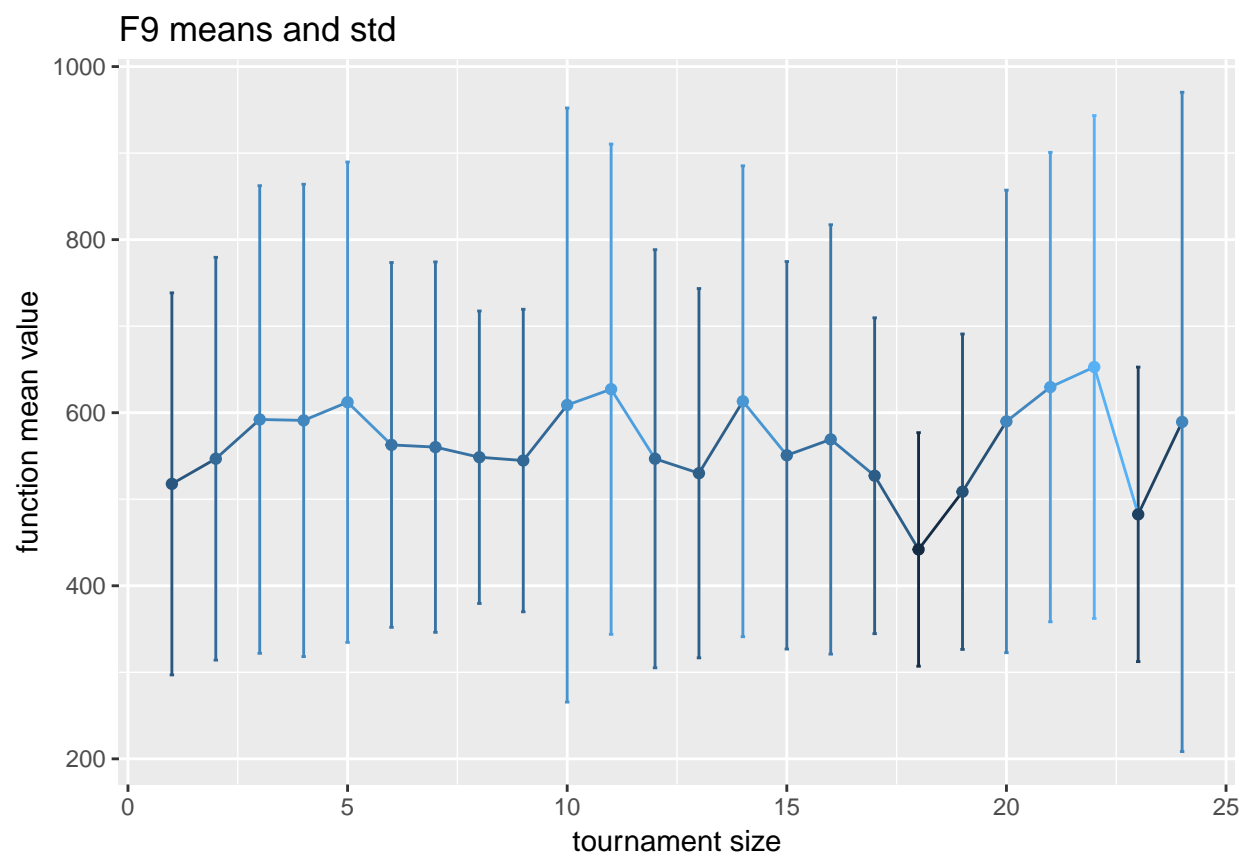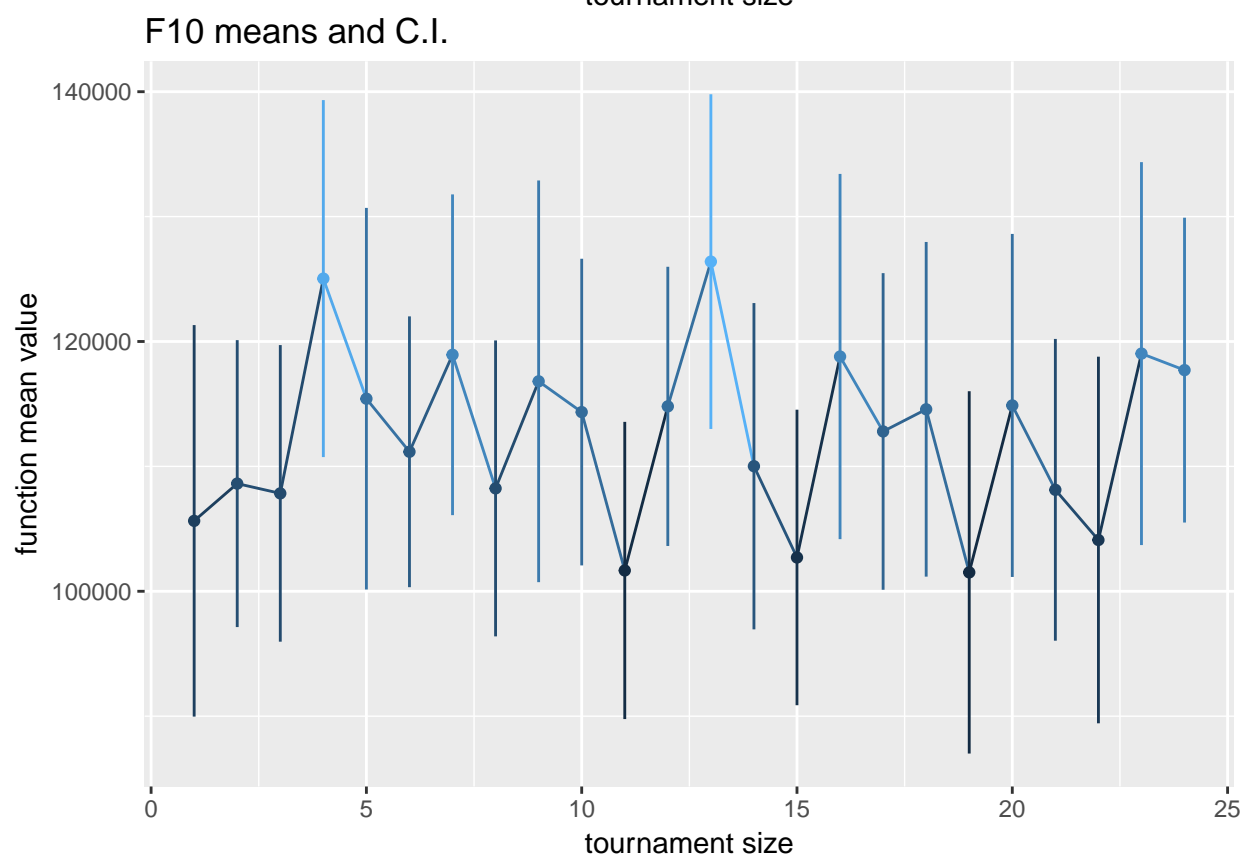
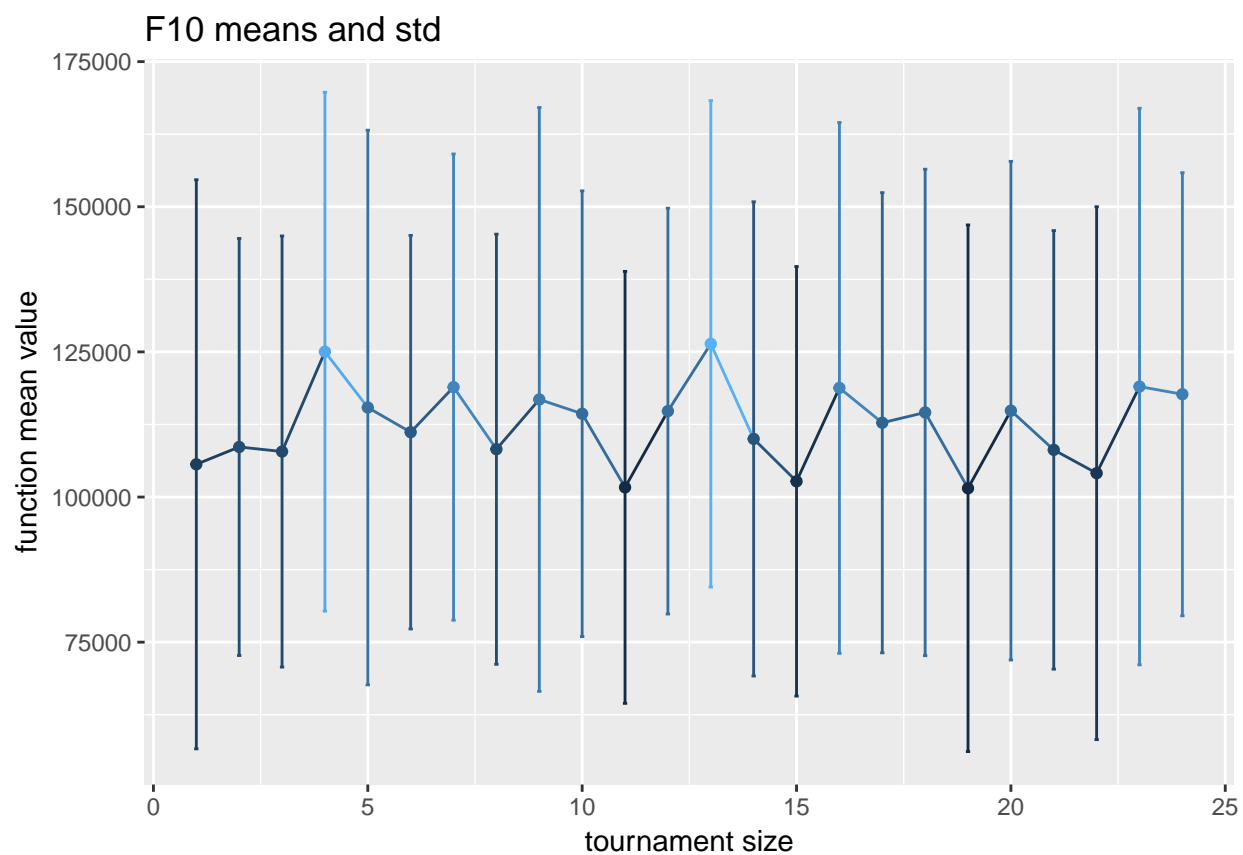F7 means and std

F7 means and C.I.
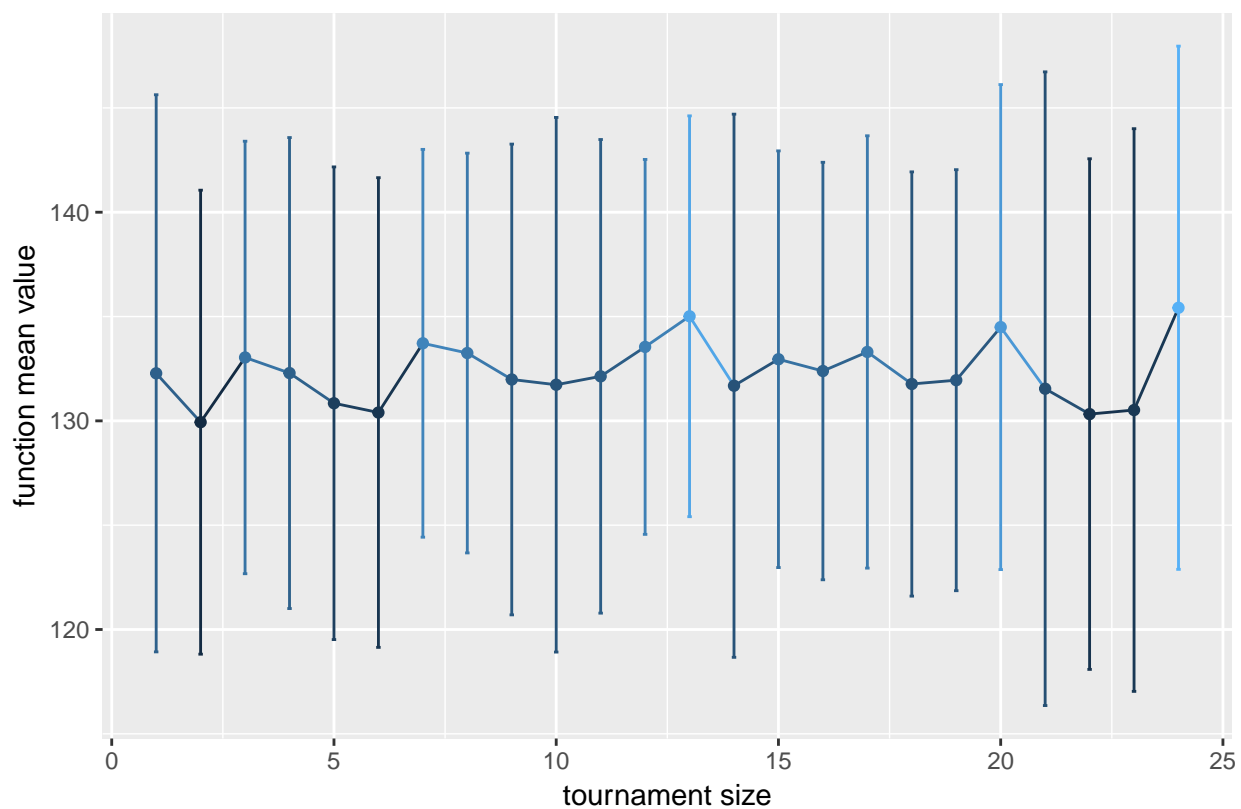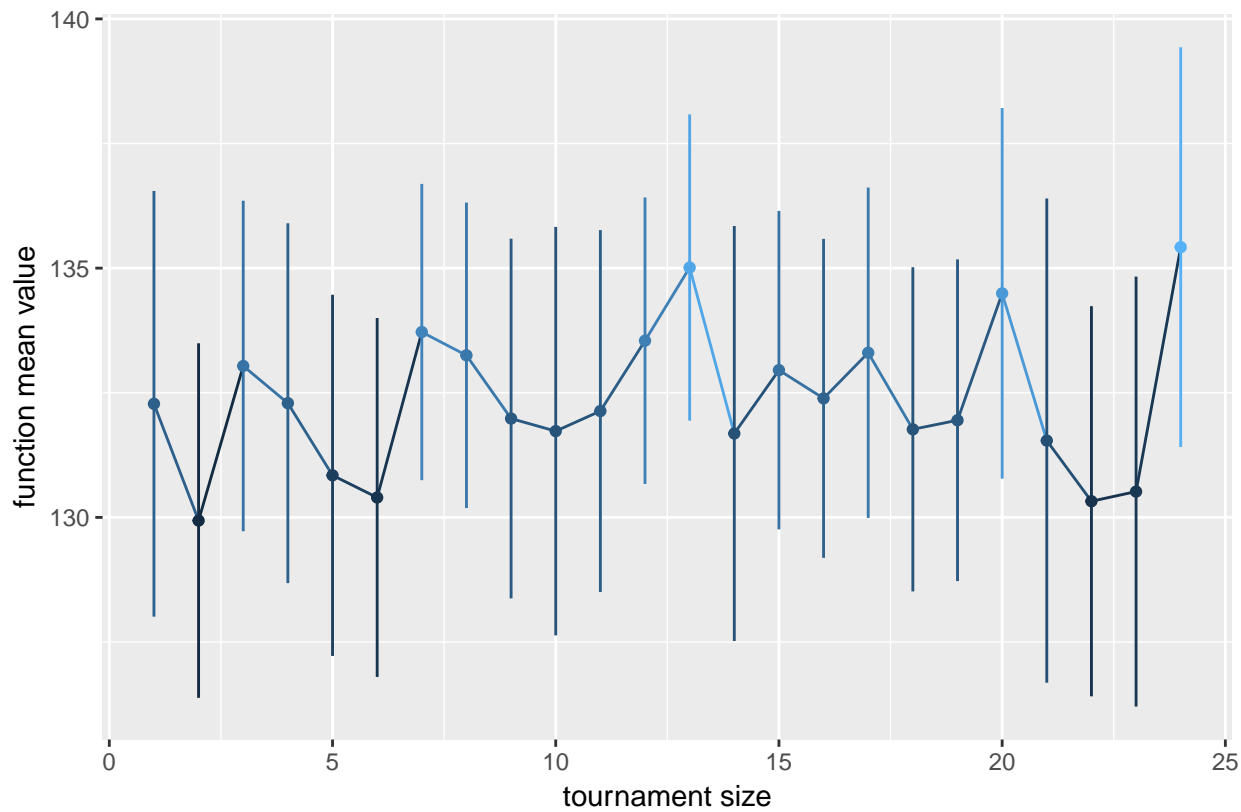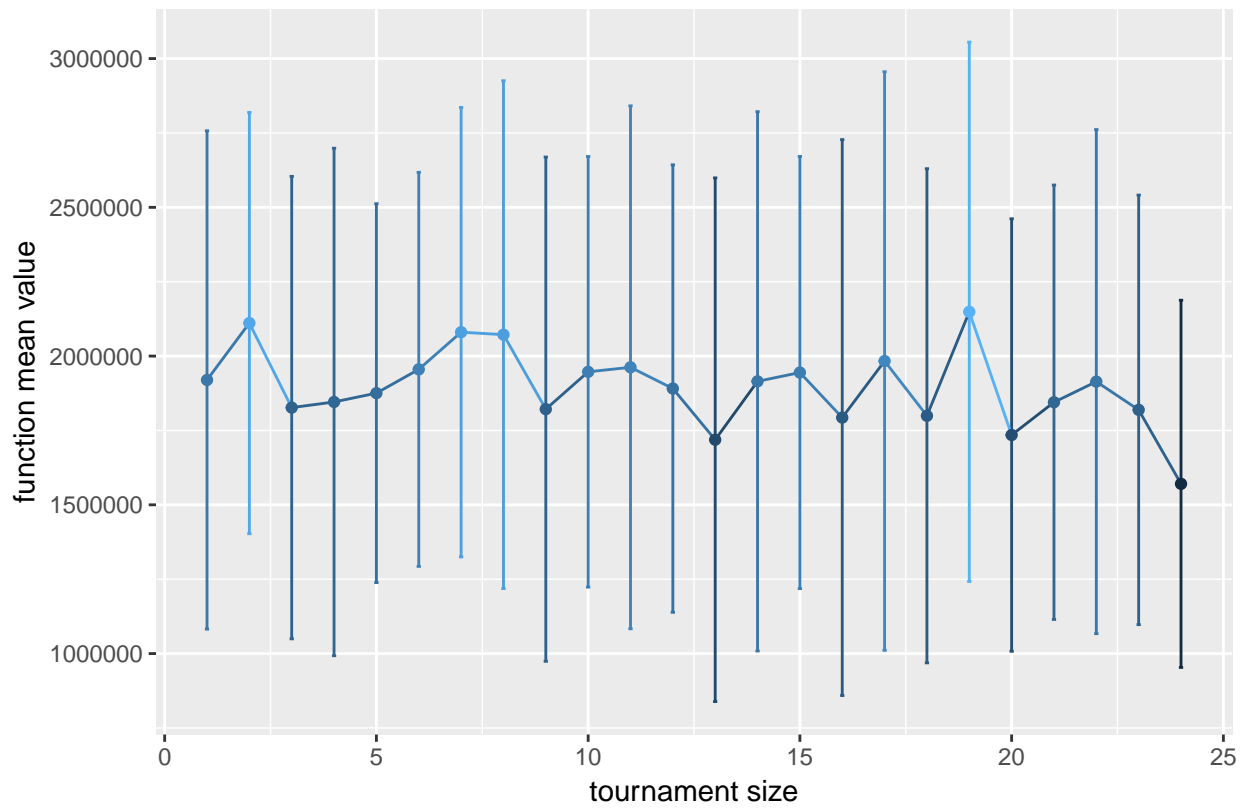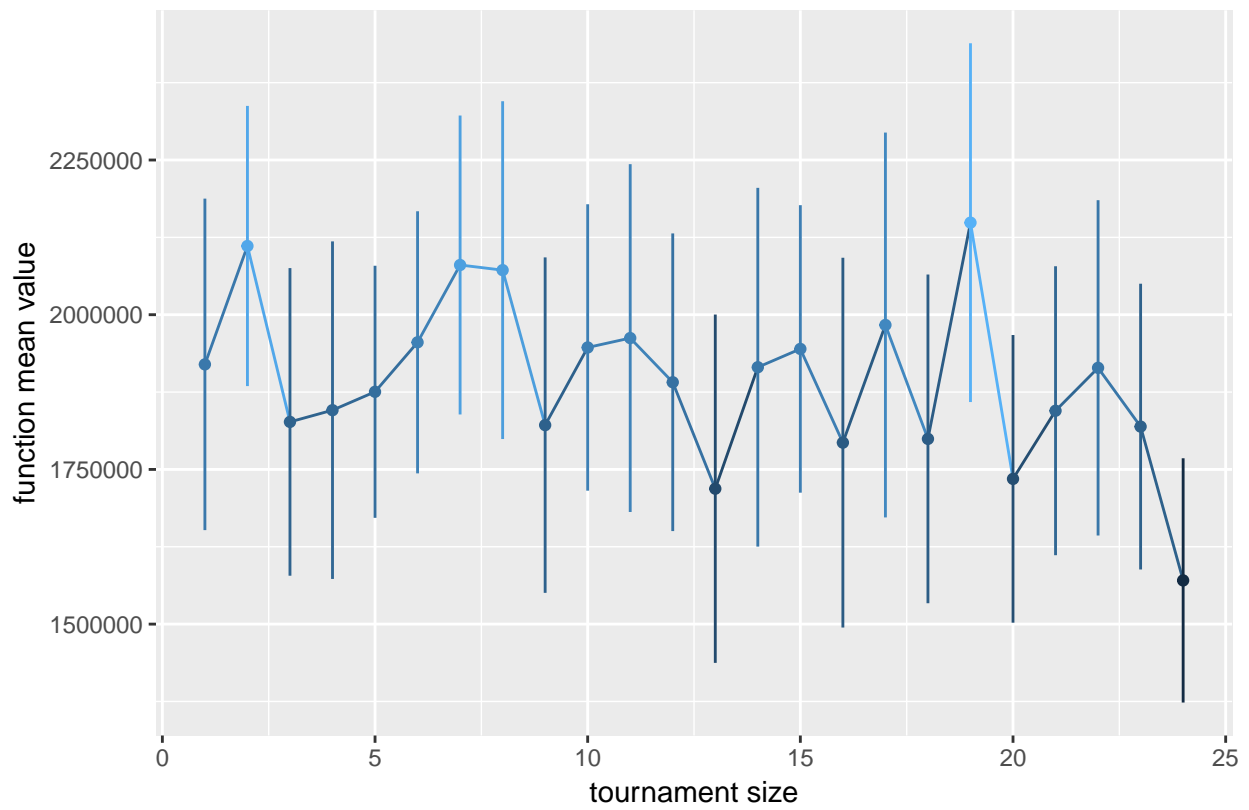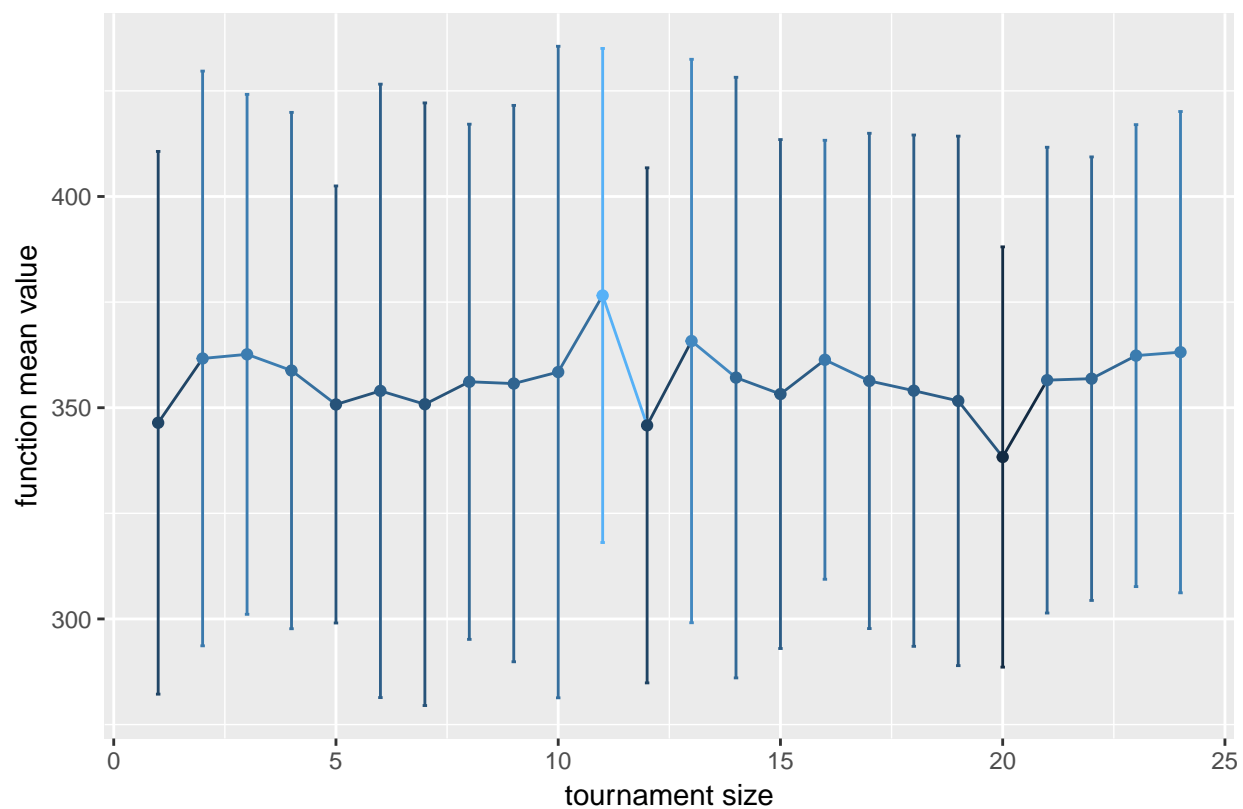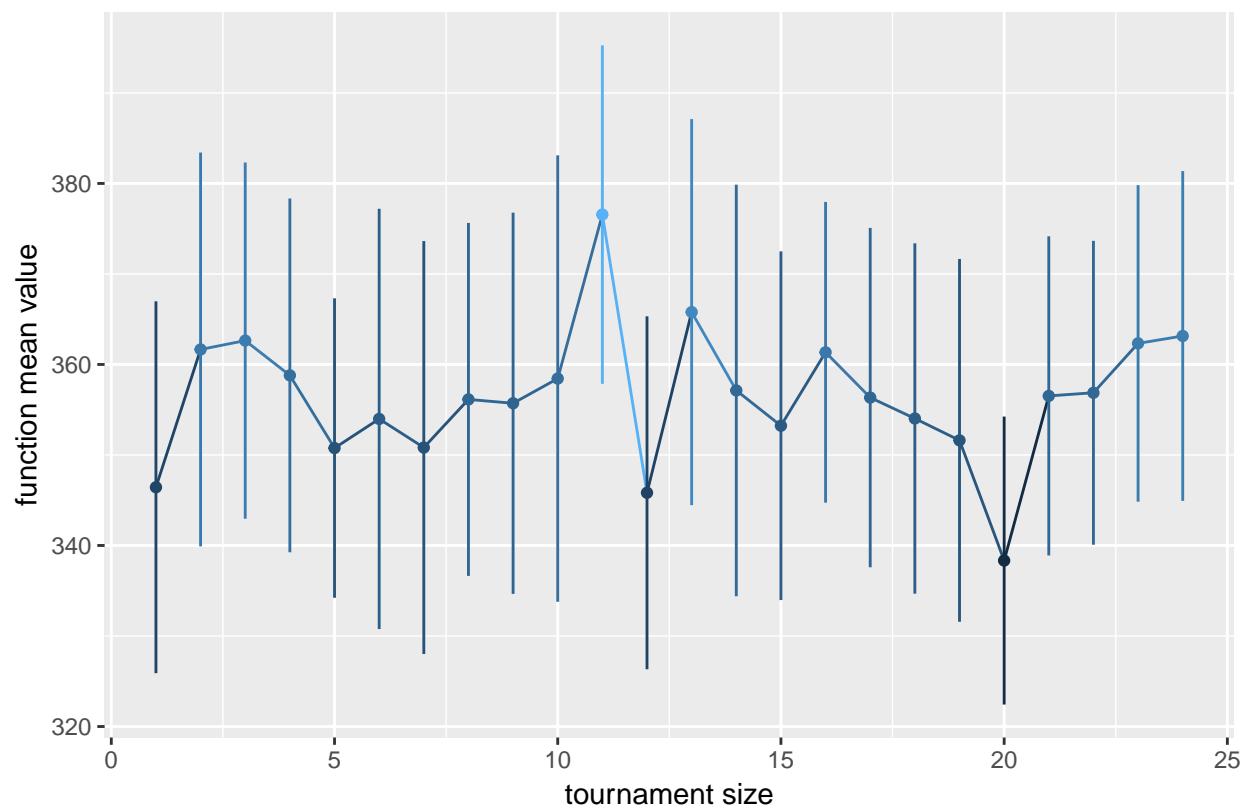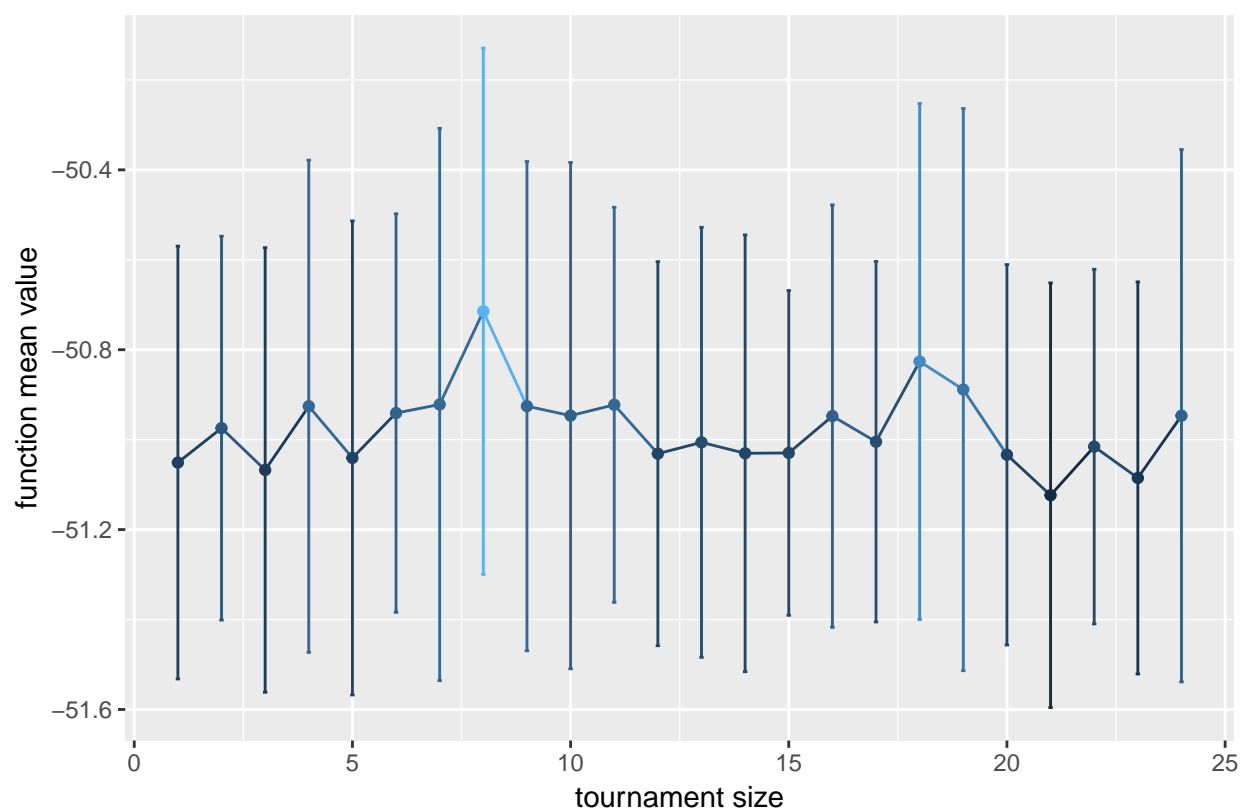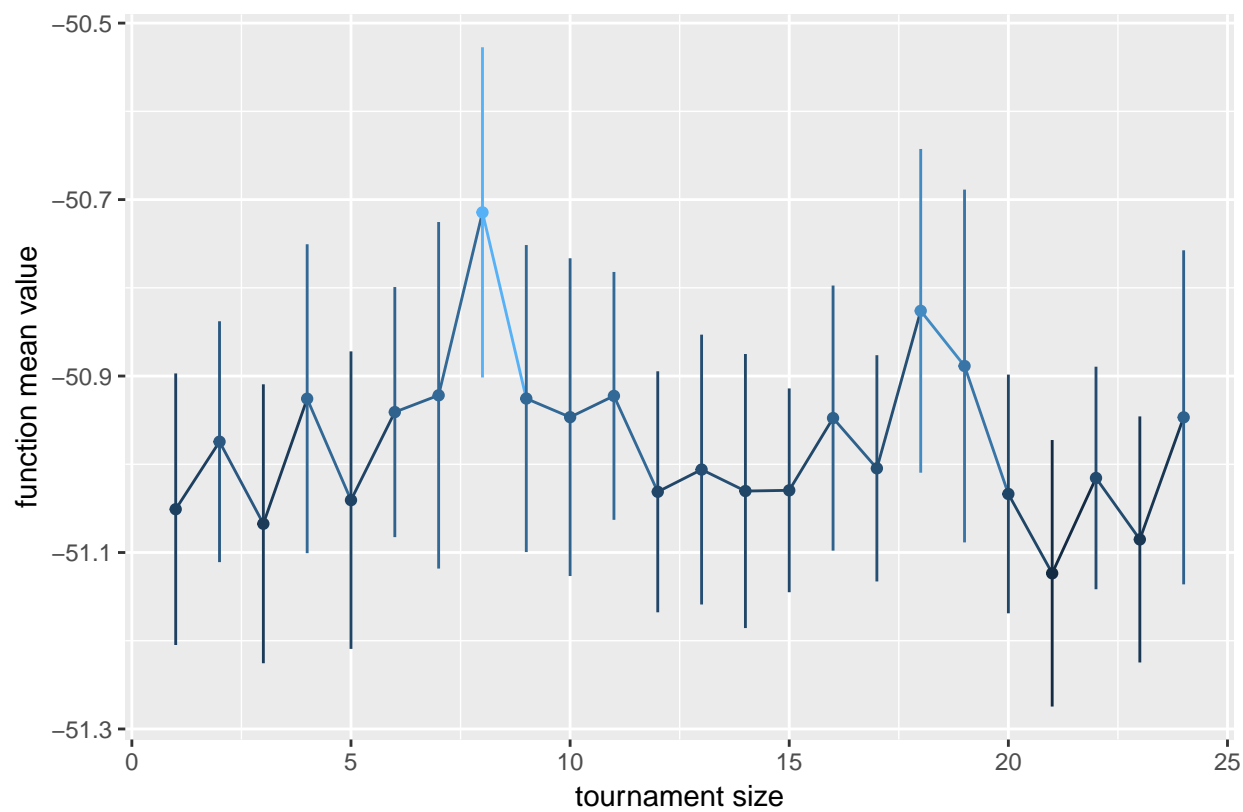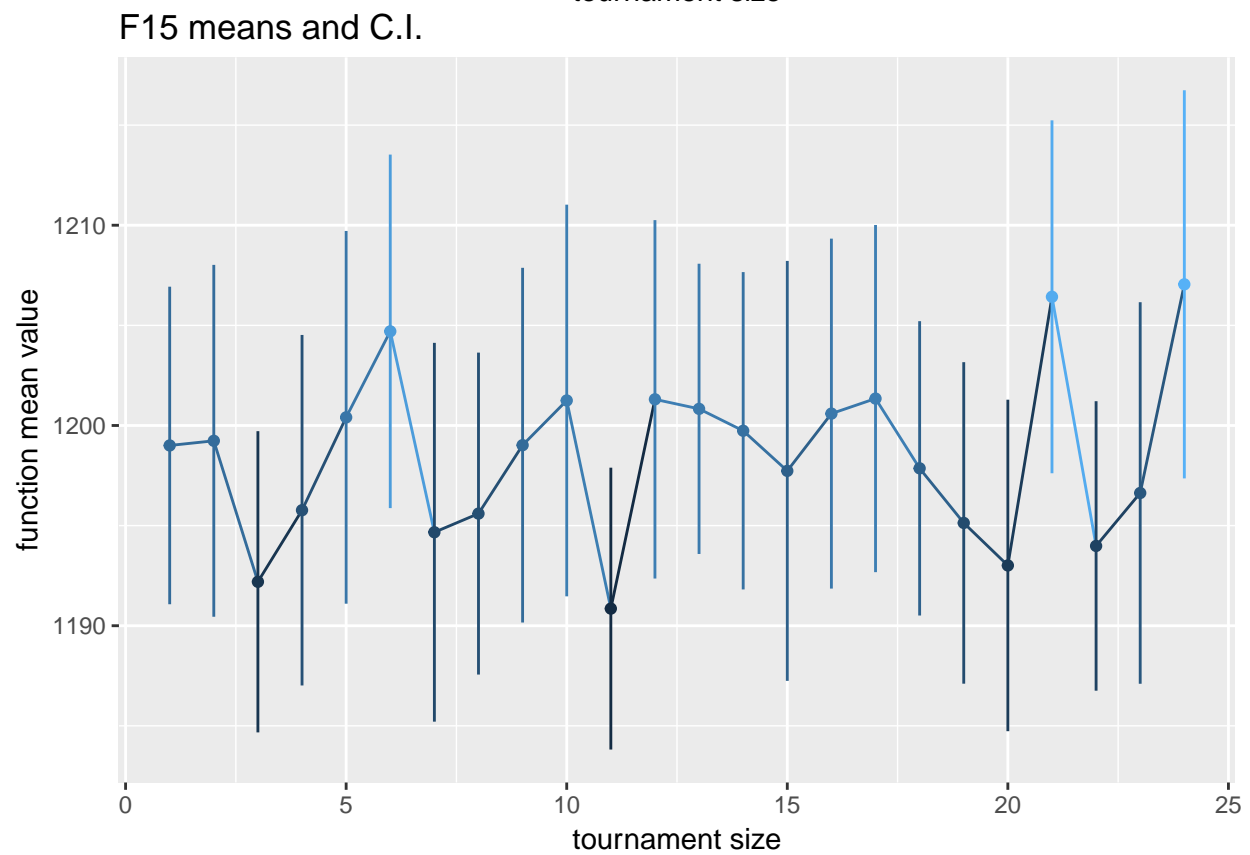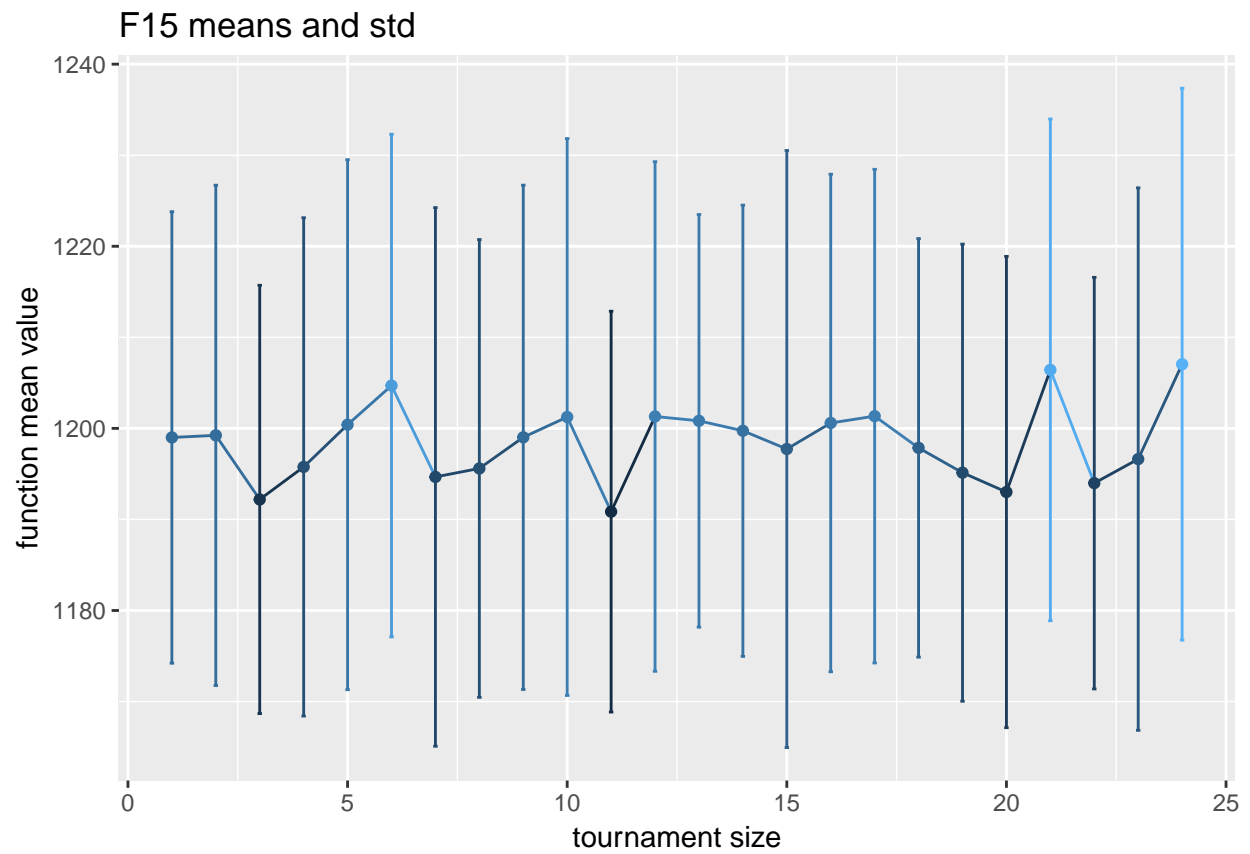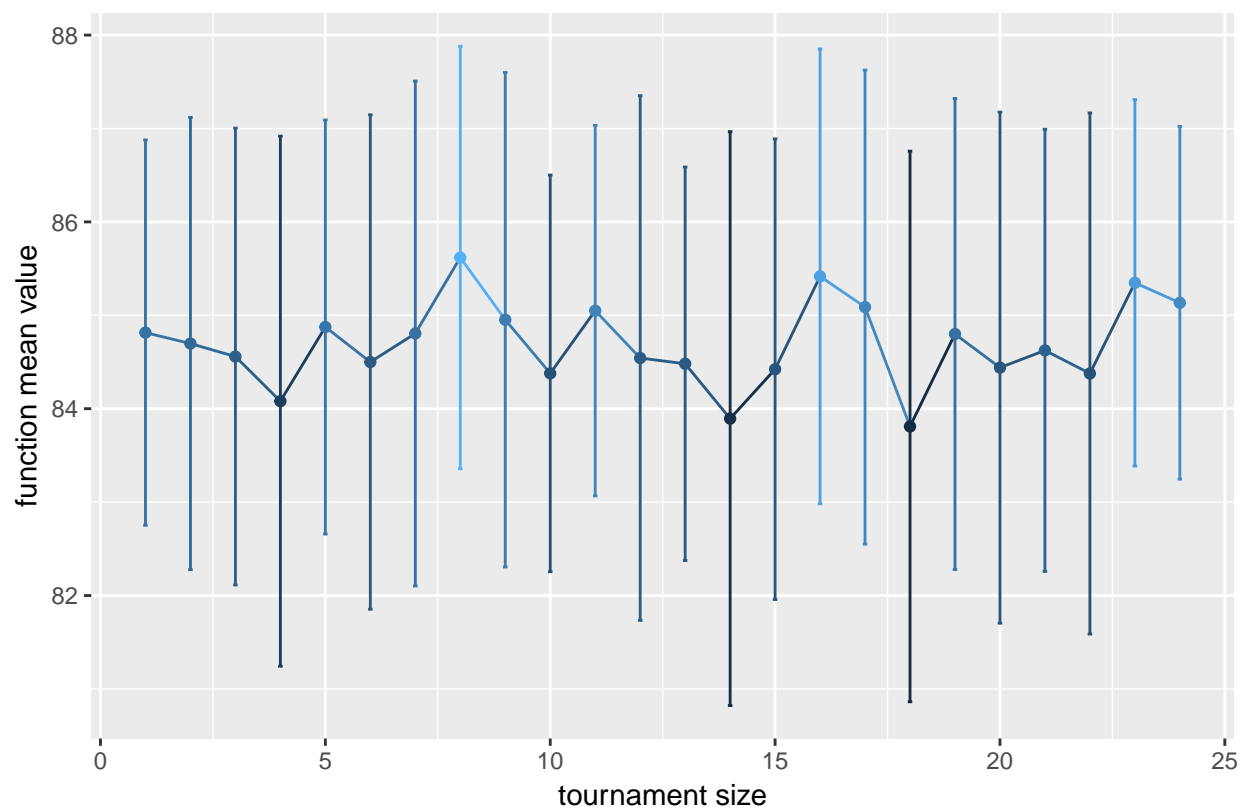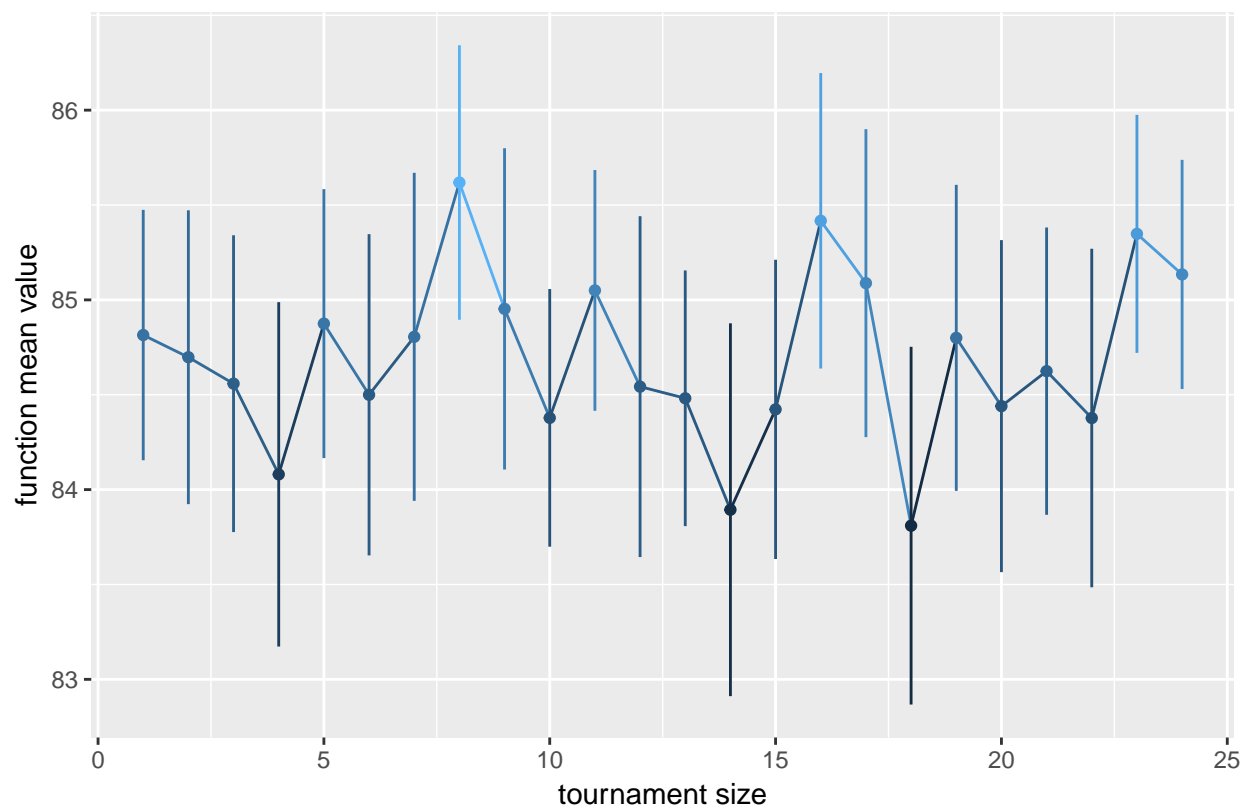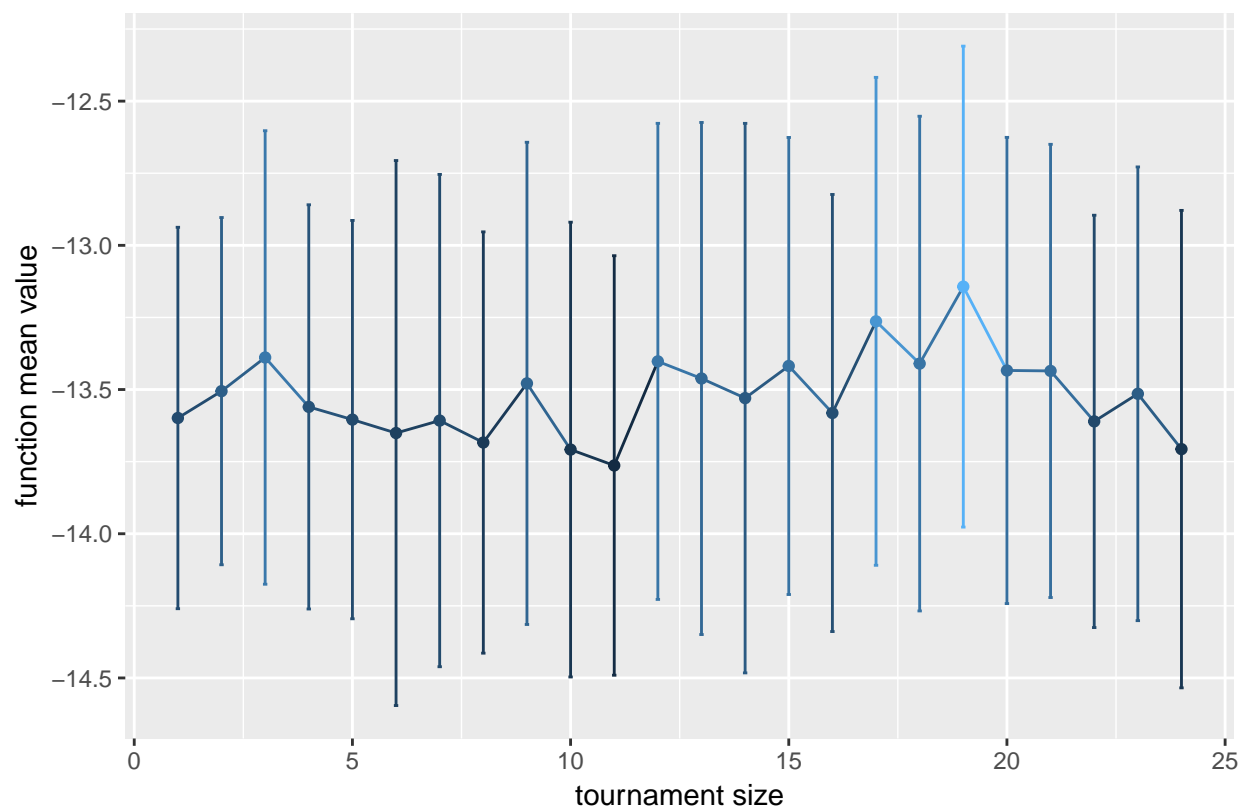
## F8 means and std



## F8 means and C.I.

F9 means and std

F9 means and C.I.

F10 means and std

F10 means and C.I.

## F11 means and std



## F11 means and C.I.

## F12 means and std



## F12 means and C.I.

F13 means and std



F13 means and C.I.

F14 means and std

F14 means and C.I.

## F15 means and std



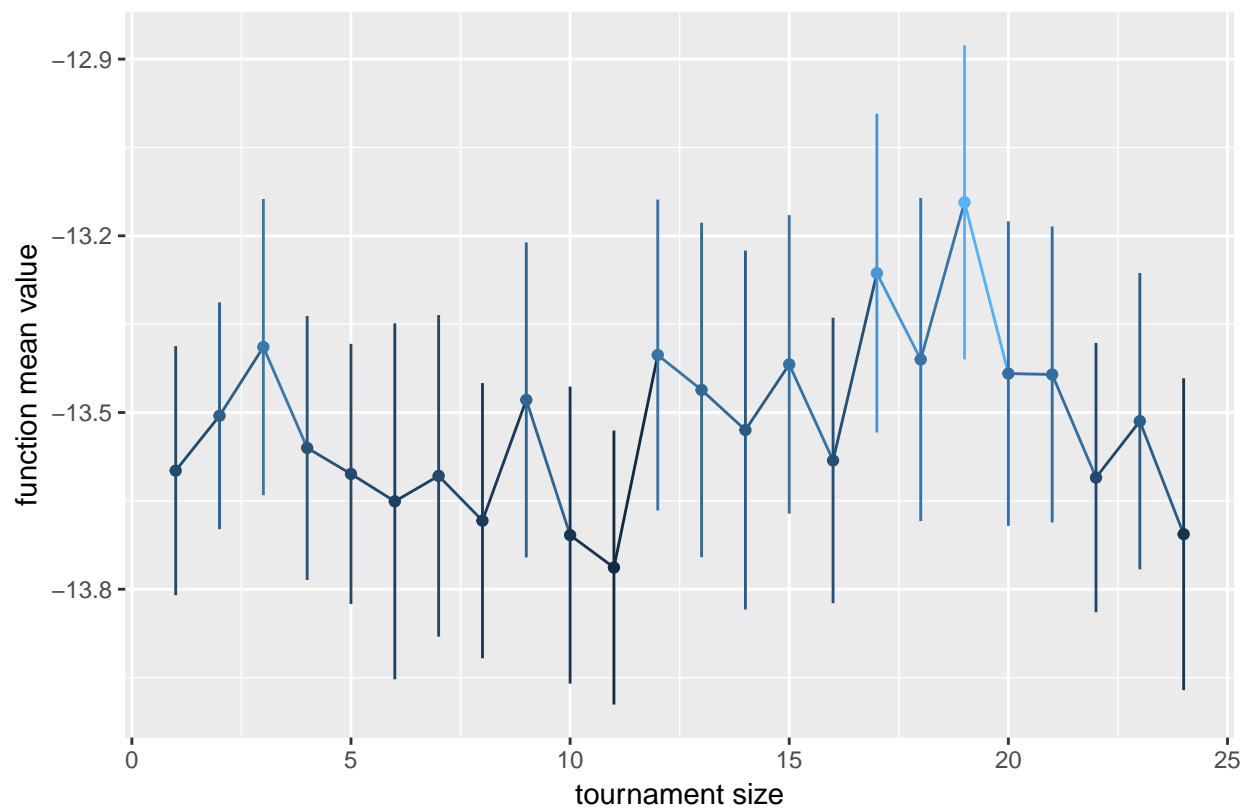## F15 means and C.I.

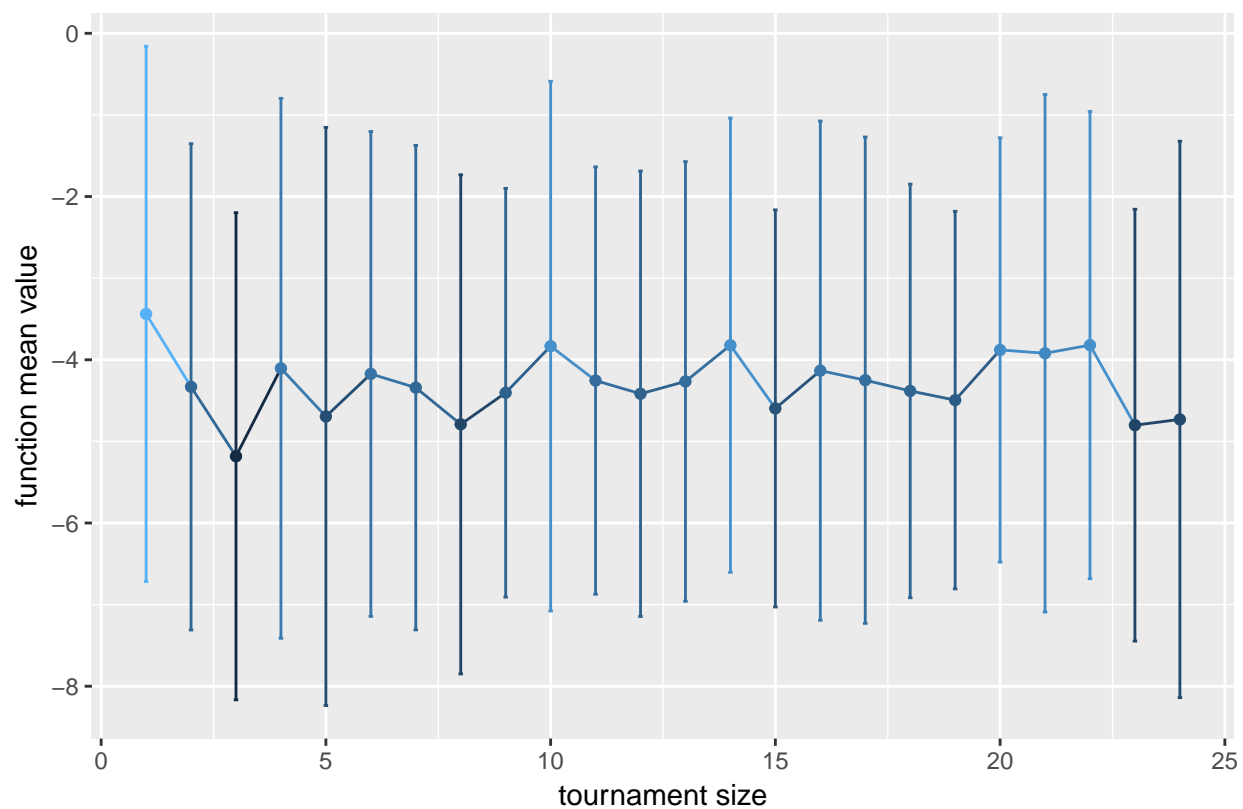F16 means and std
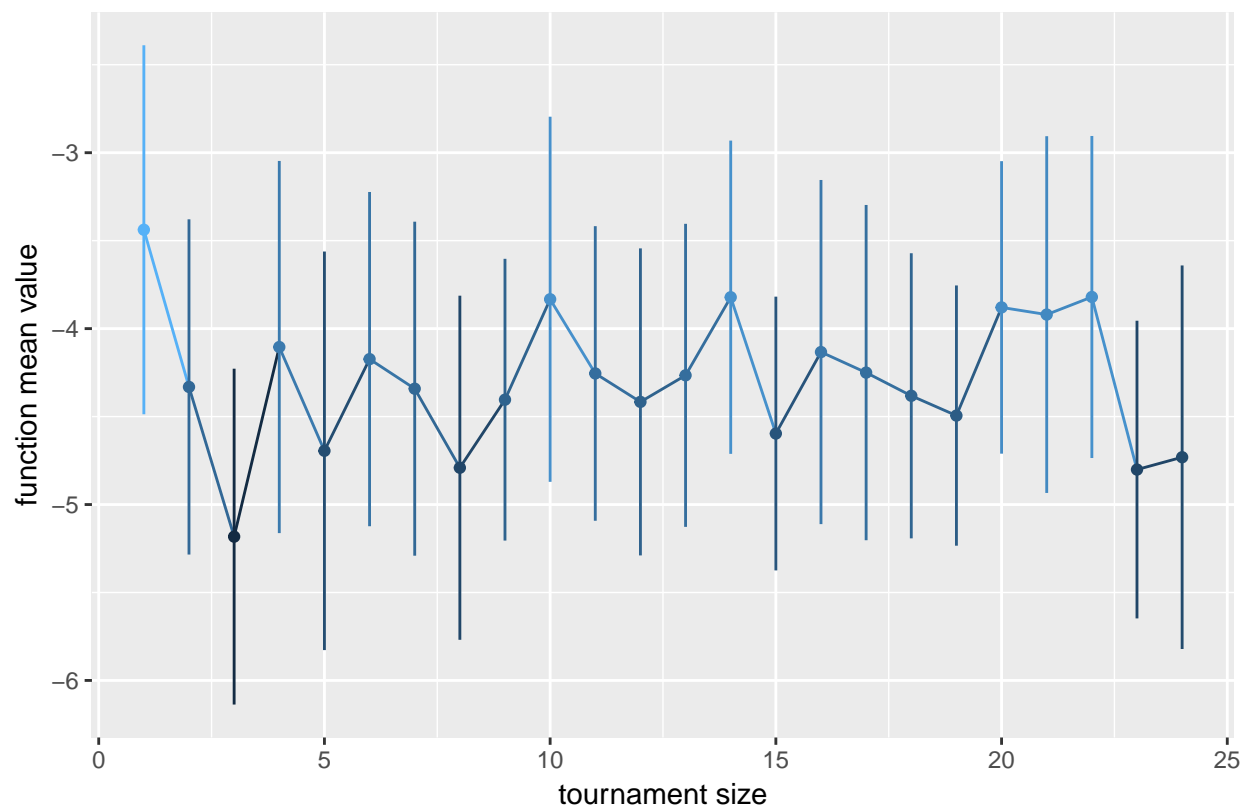
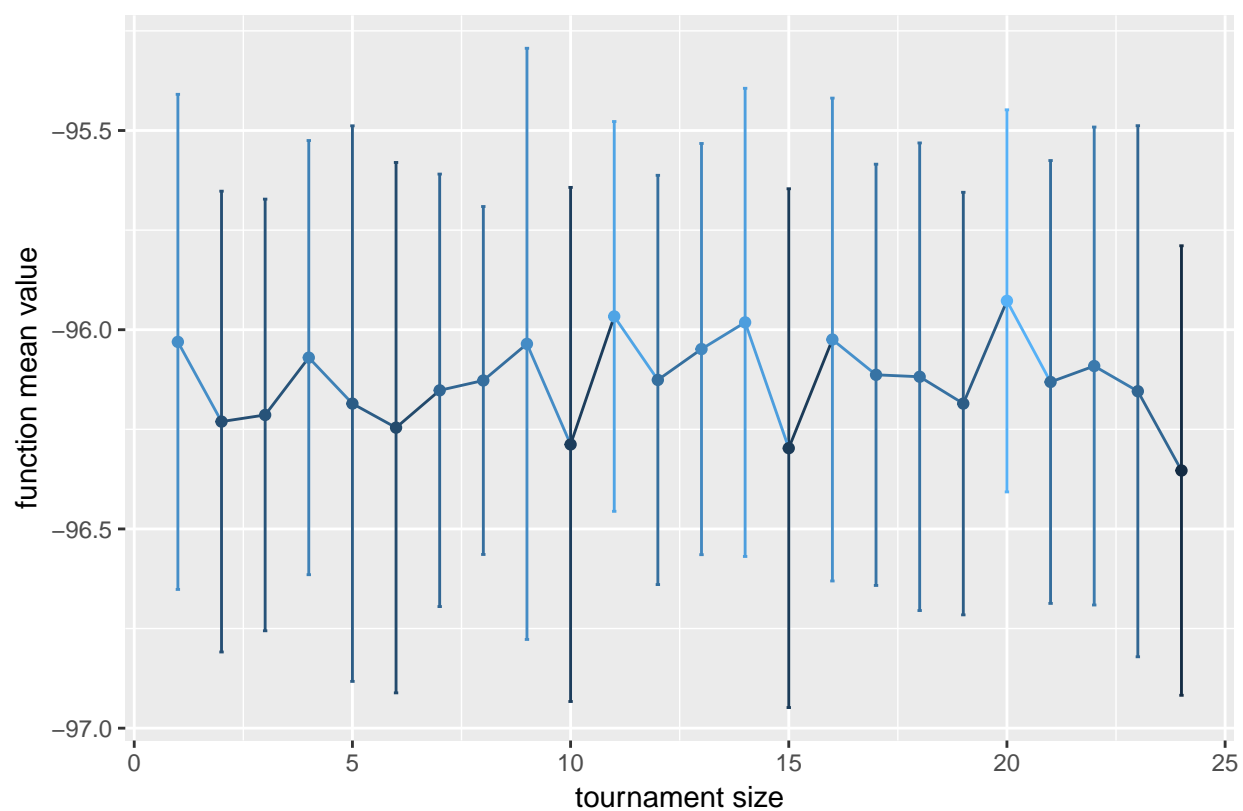F16 means and C.I.

F17 means and std
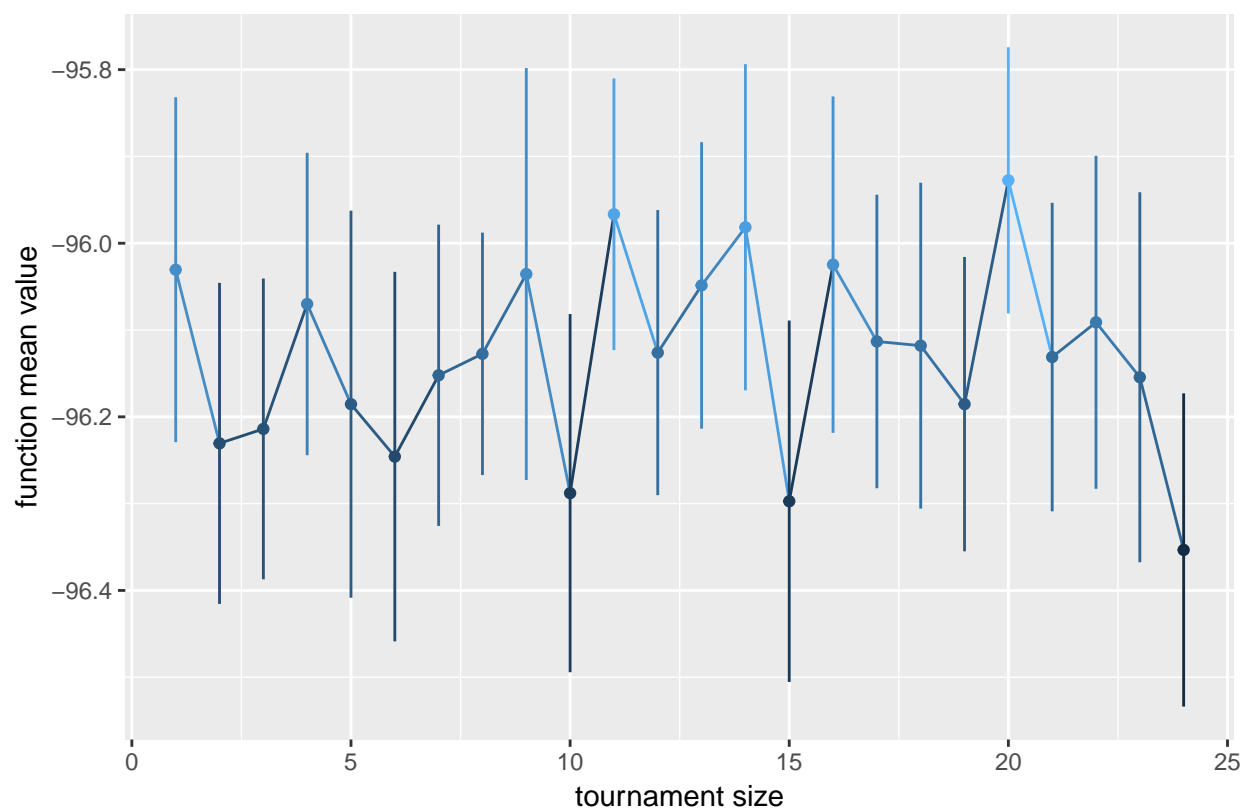


F17 means and C.I.
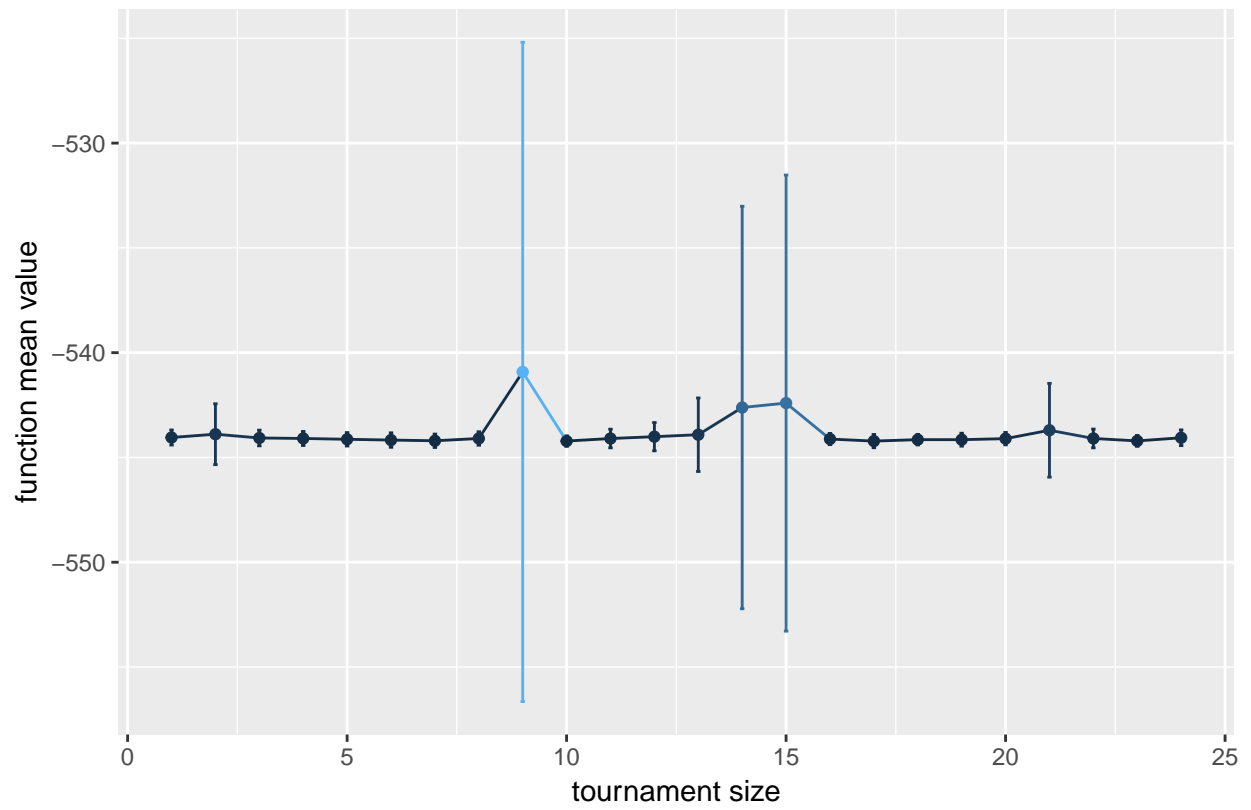
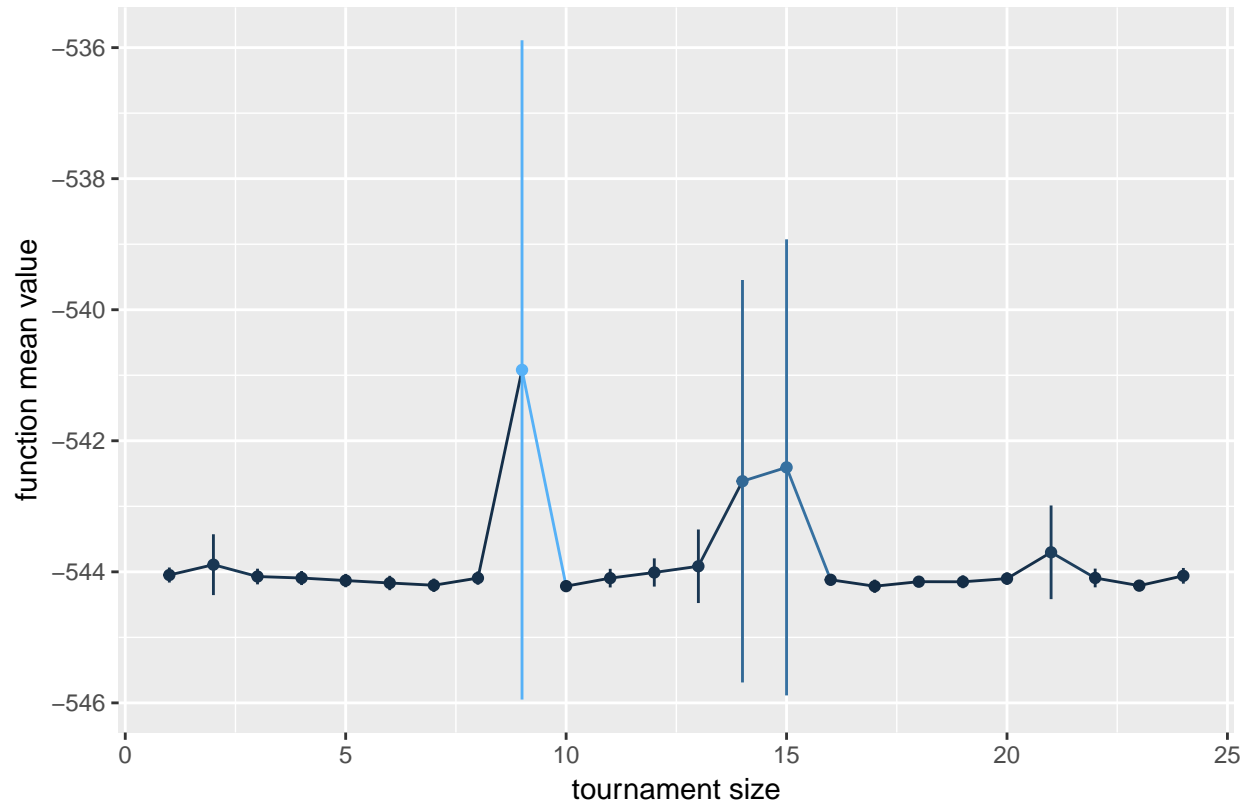F18 means and std



F18 means and C.I.
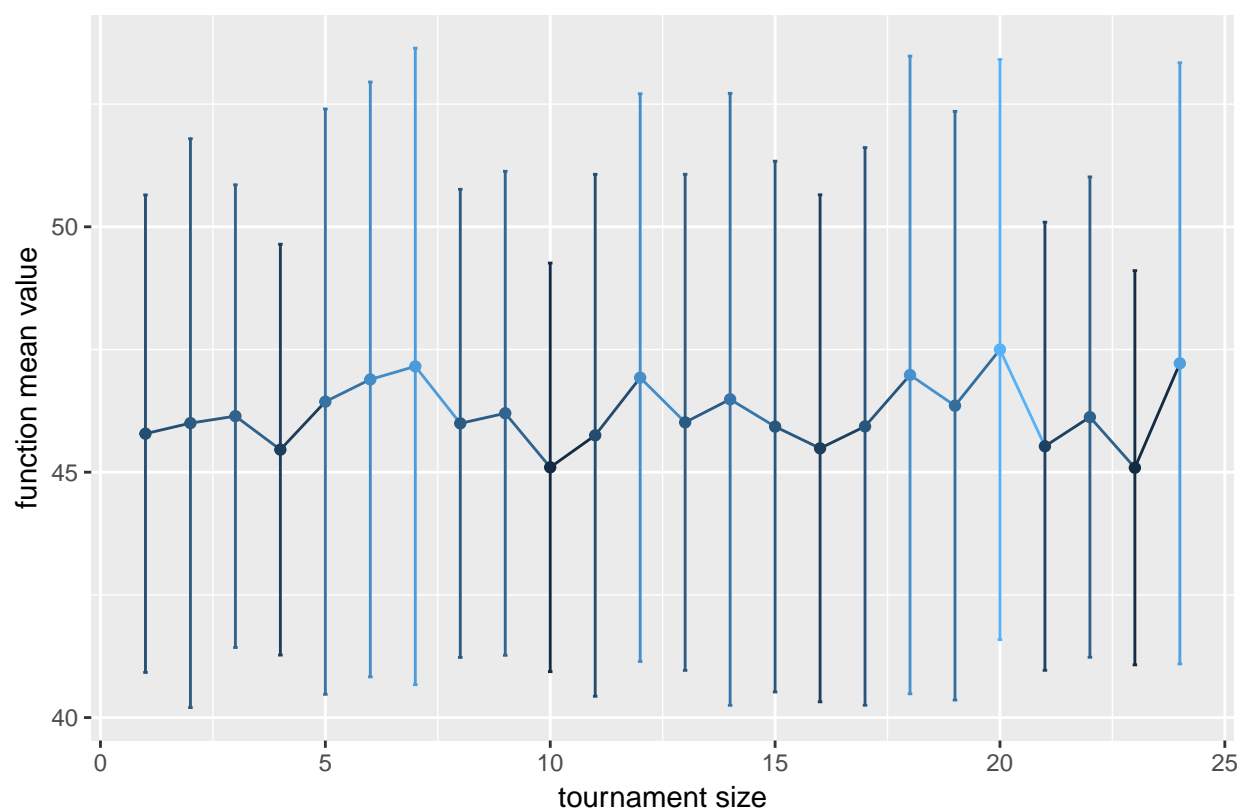
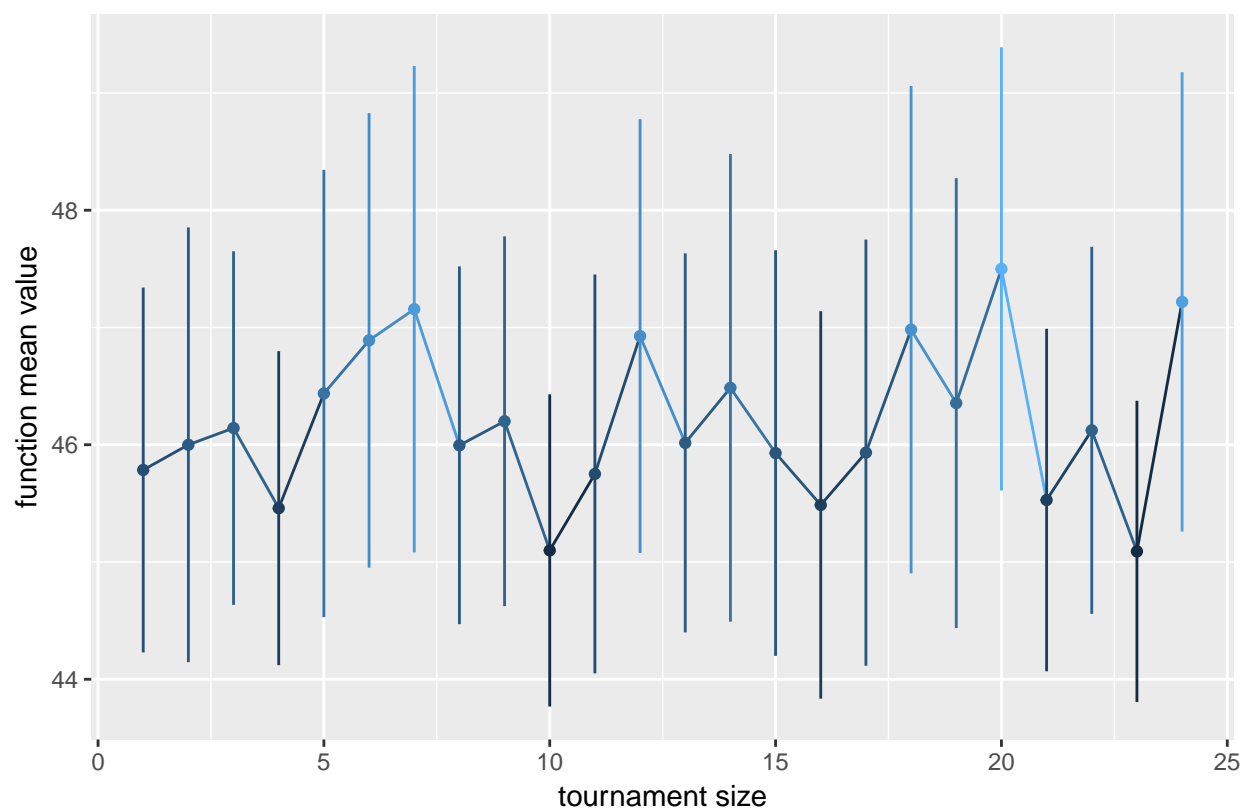F19 means and std
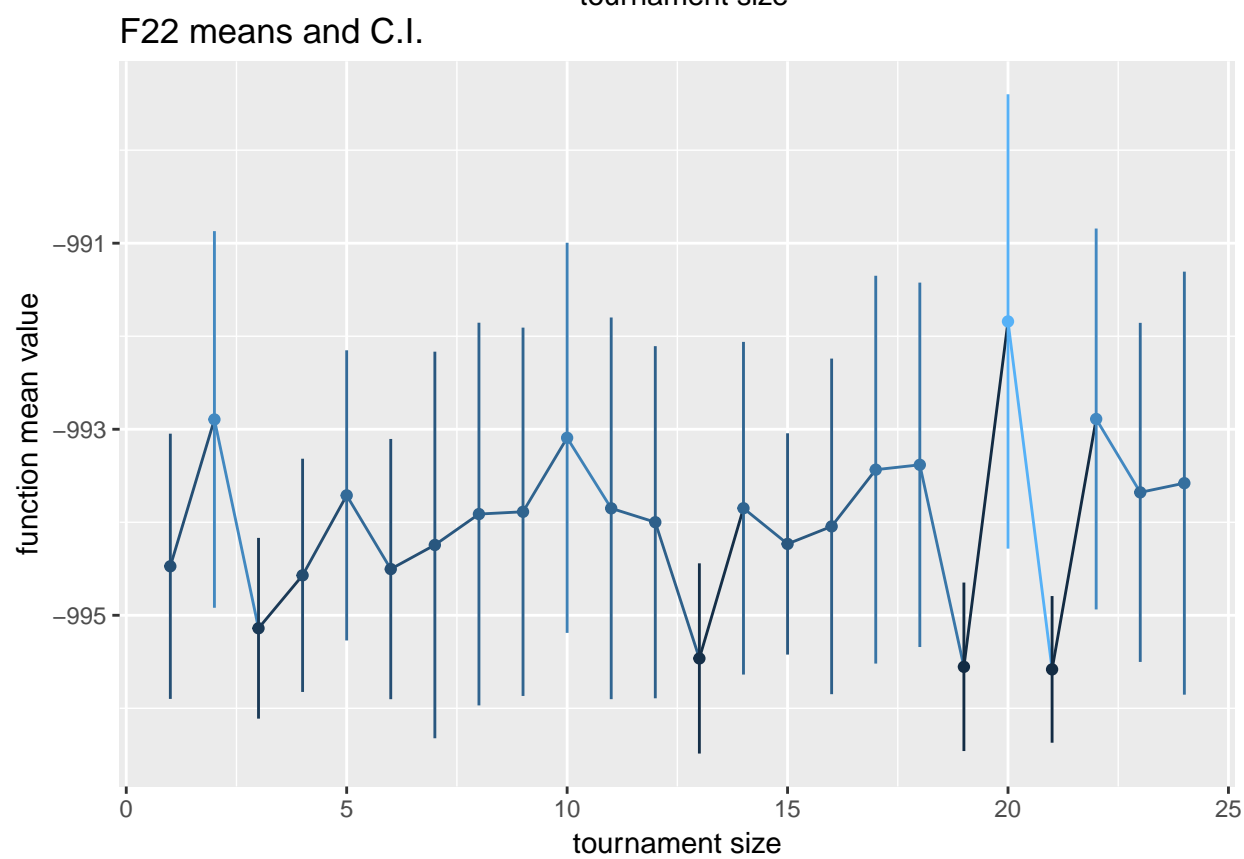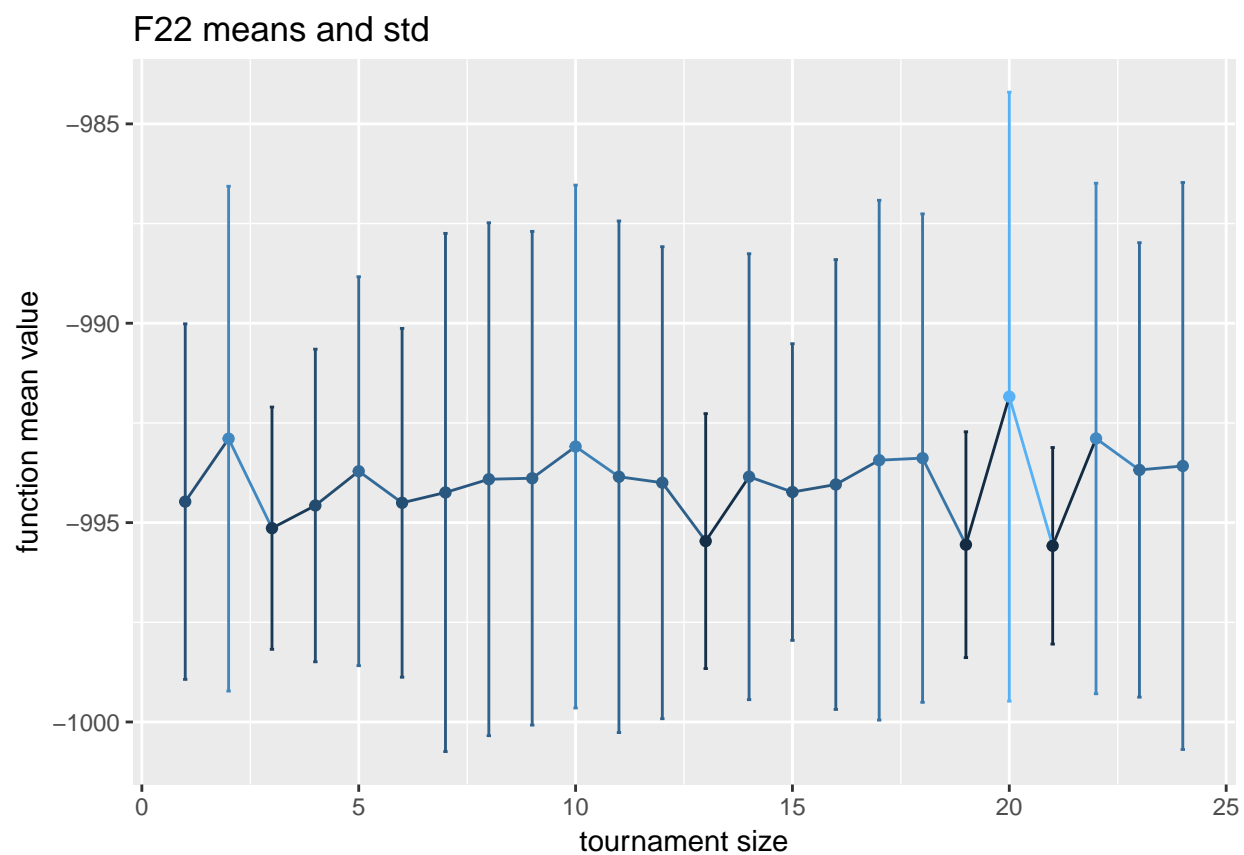

F19 means and C.I.

F20 means and std

F20 means and C.I.

## F21 means and std
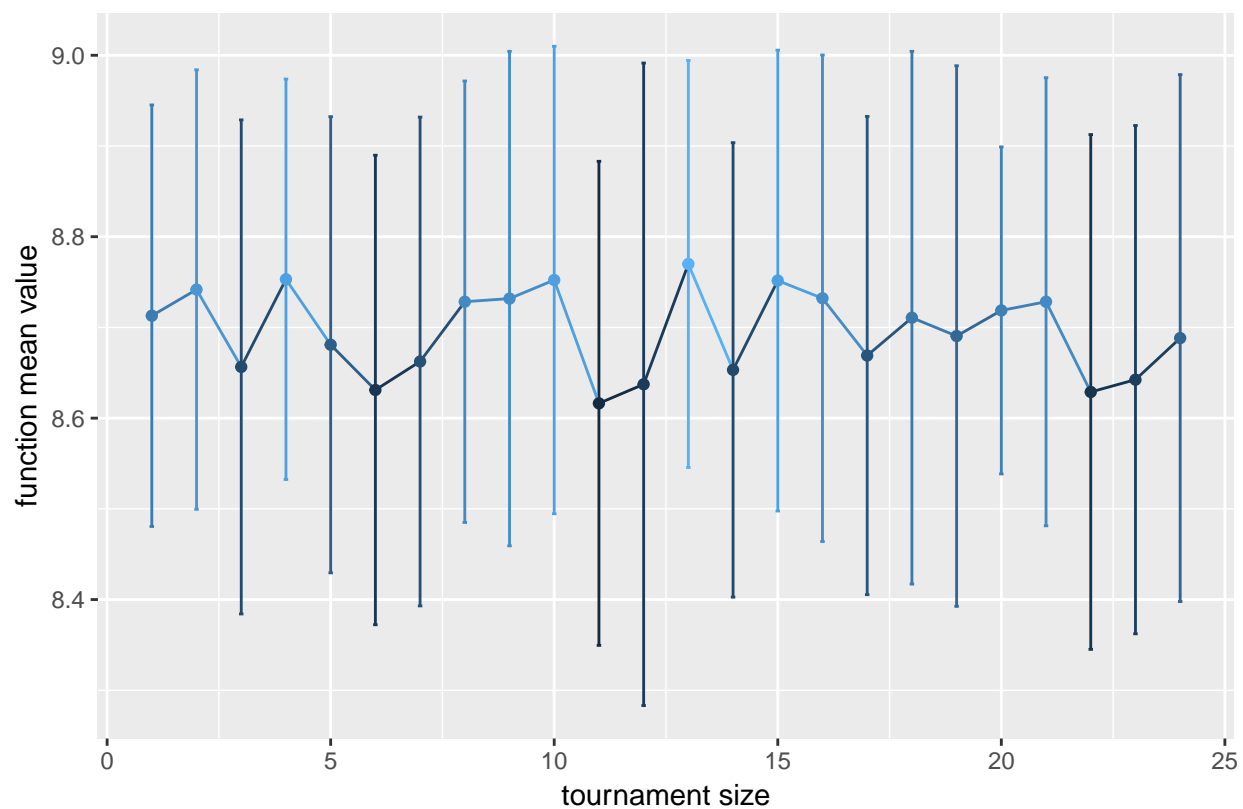


## F21 means and C.I.
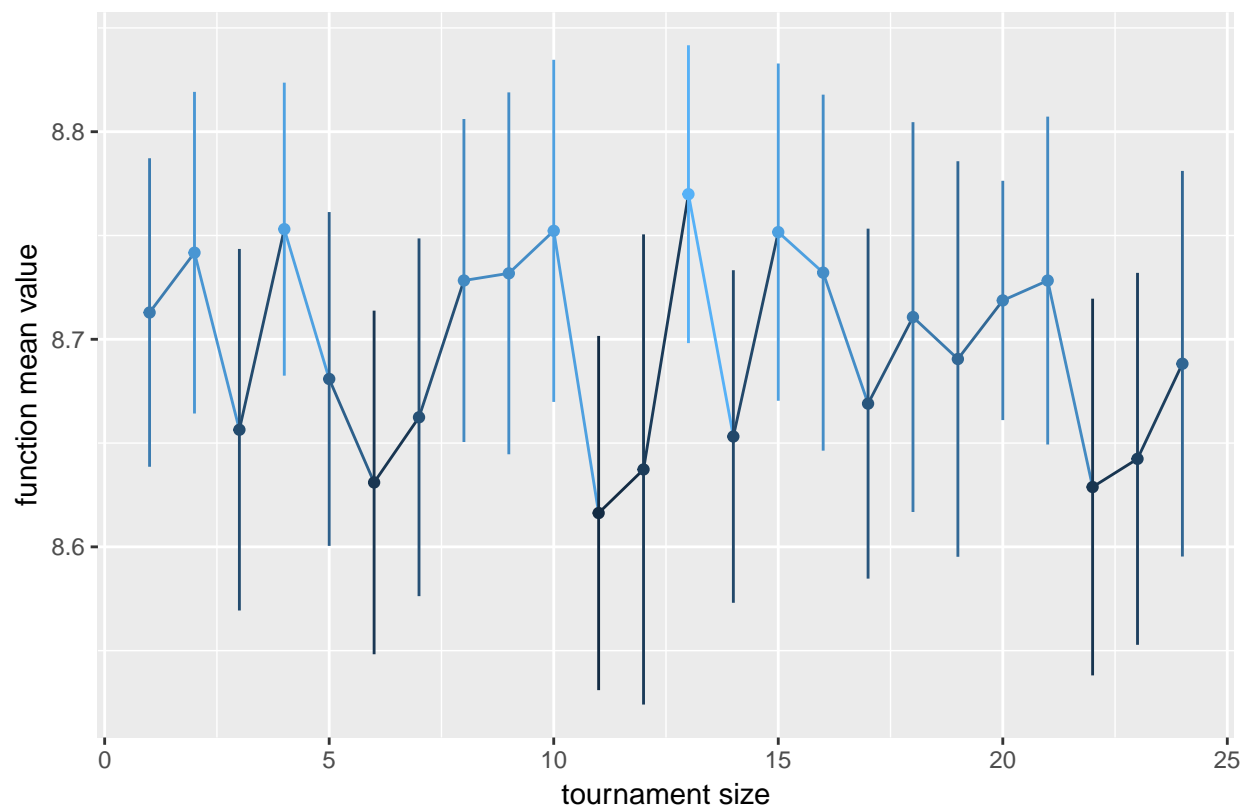
F22 means and std

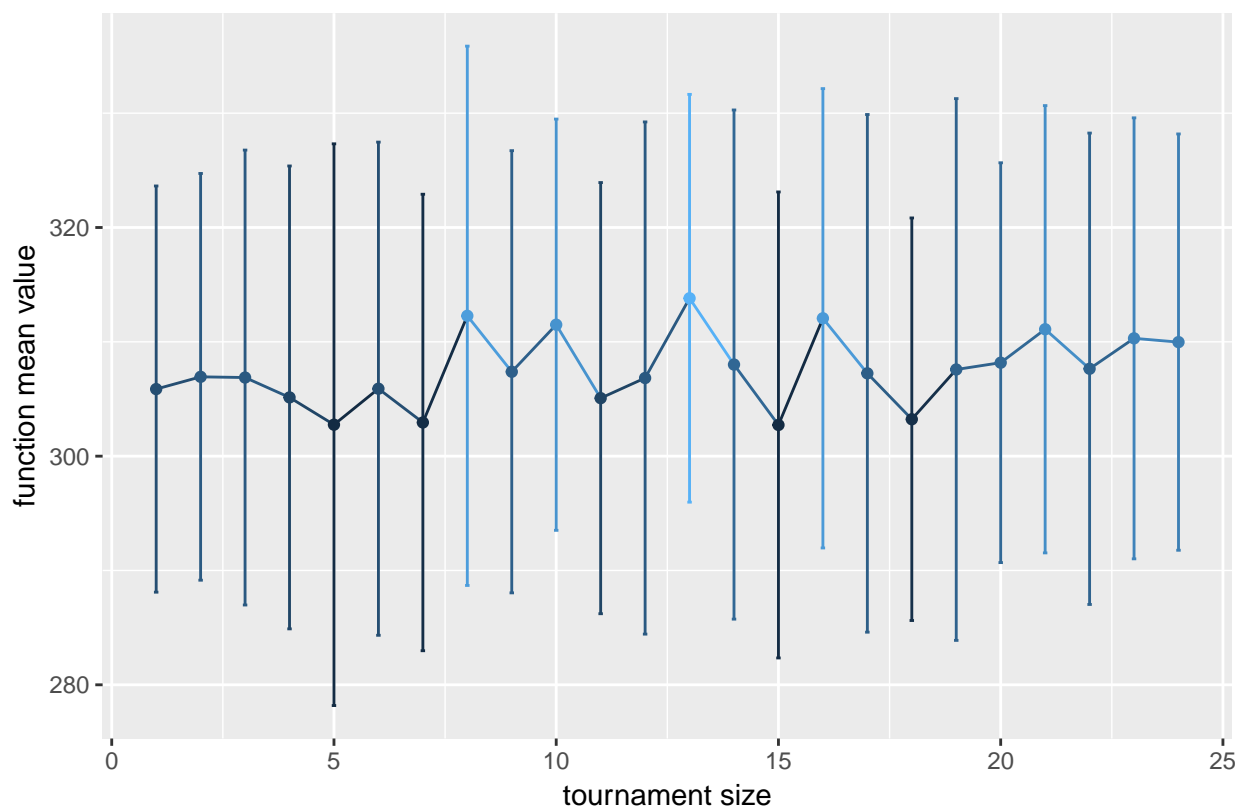F22 means and C.I.

# F23 means and std



# F23 means and C.I.

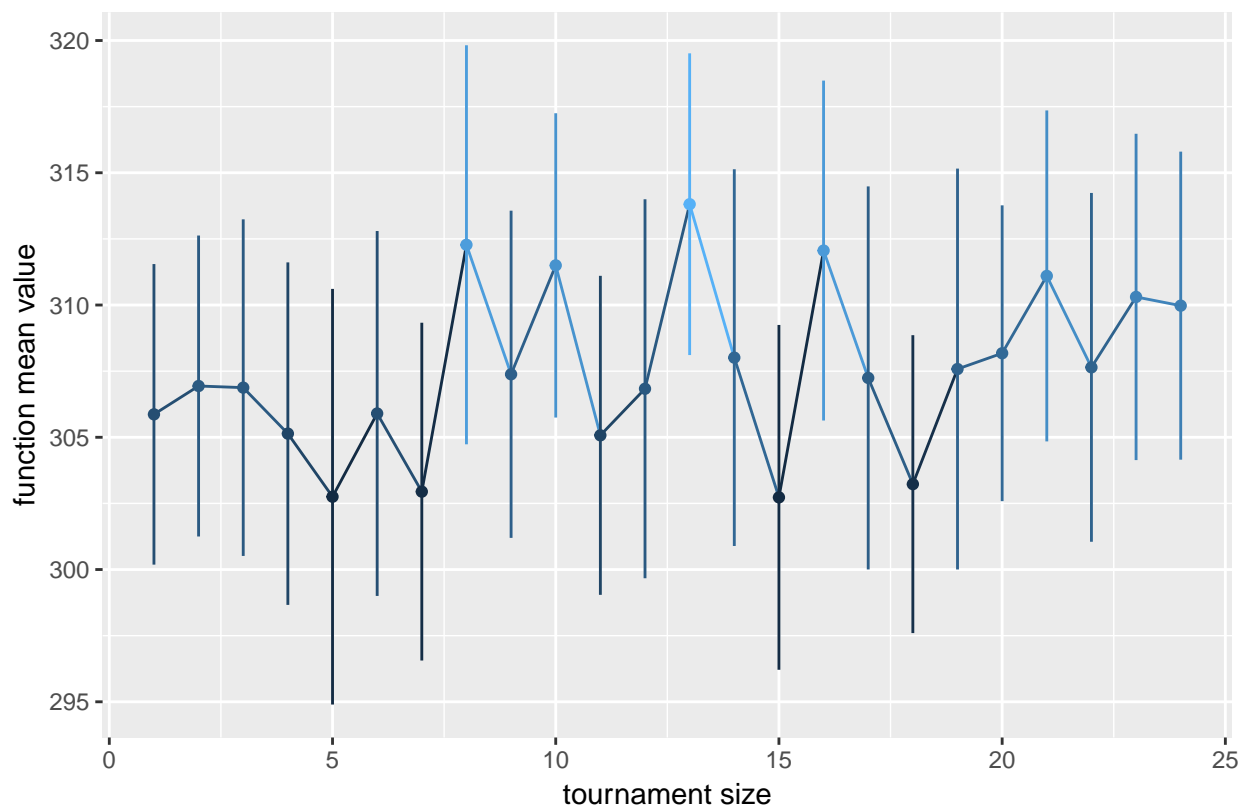F24 means and std

F24 means and C.I.

## Convergency Plots

Based on the best values for K, from plots of the last section, we made the convergency plots. Not all k values are represented because the plot are basically the same. Also the std was omitted, because in some plots the difference betwen the std and the mean is very big. In those cases, it was difficult to see any convergency (the line was almost a straight line).
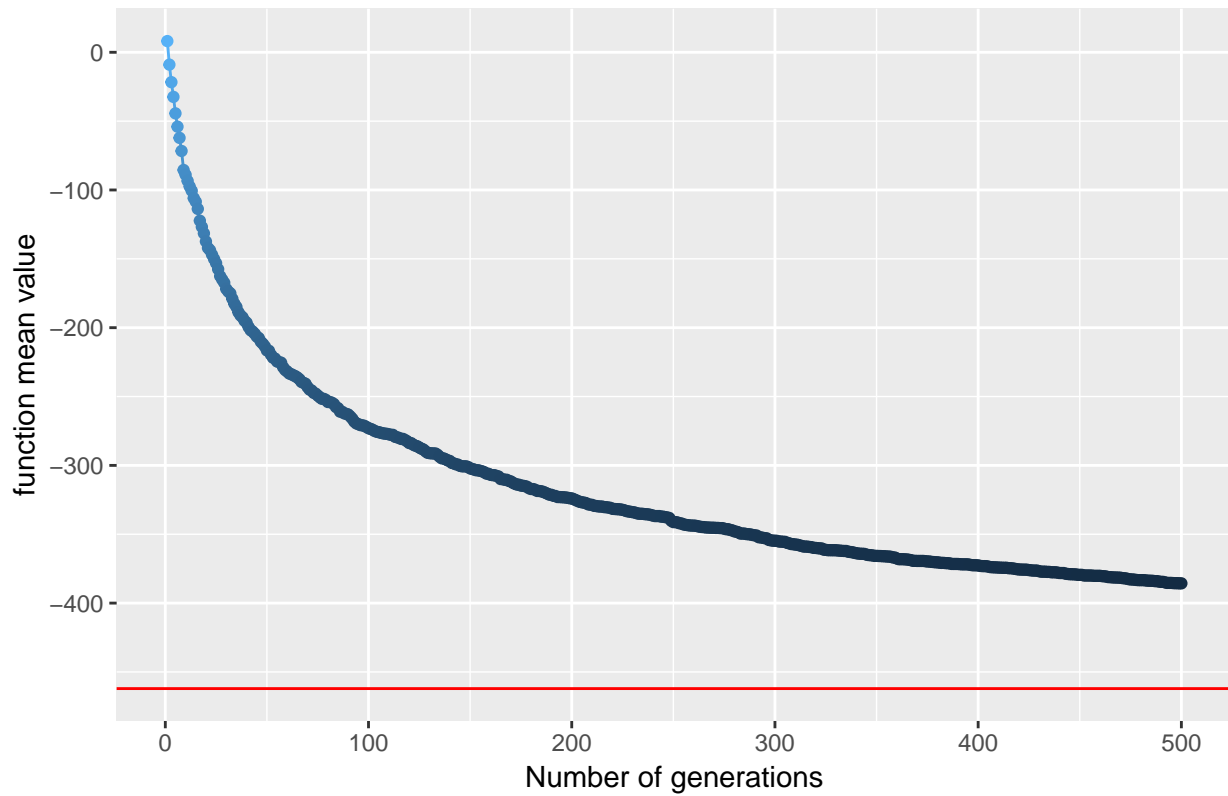
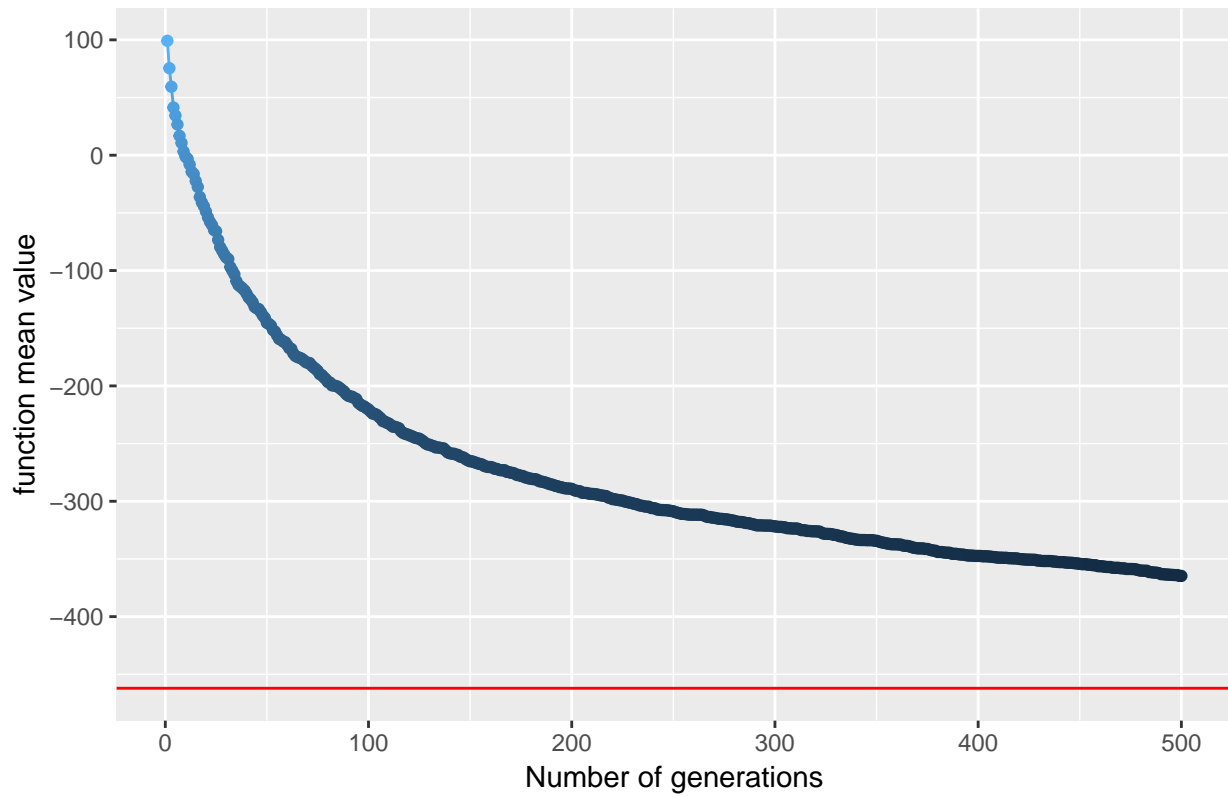# F1 with last gen mean: 81.235405 and target value: 79.48000001
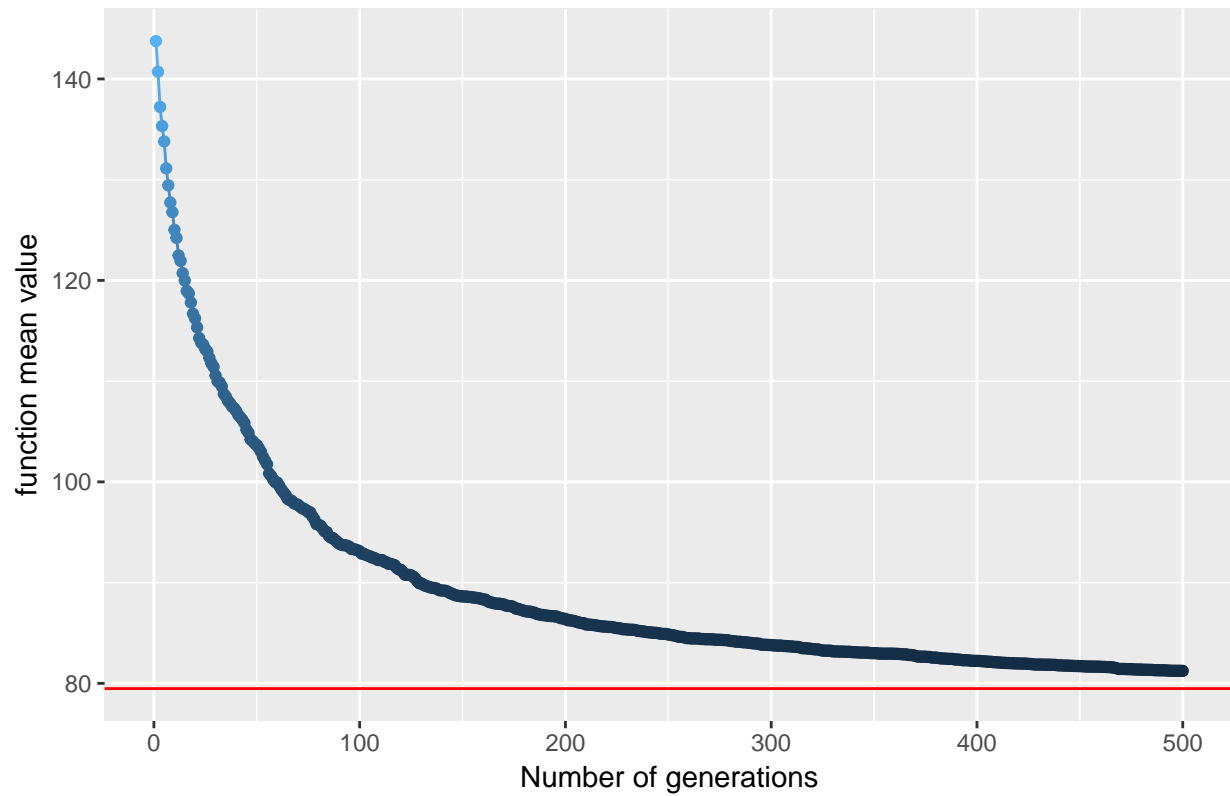


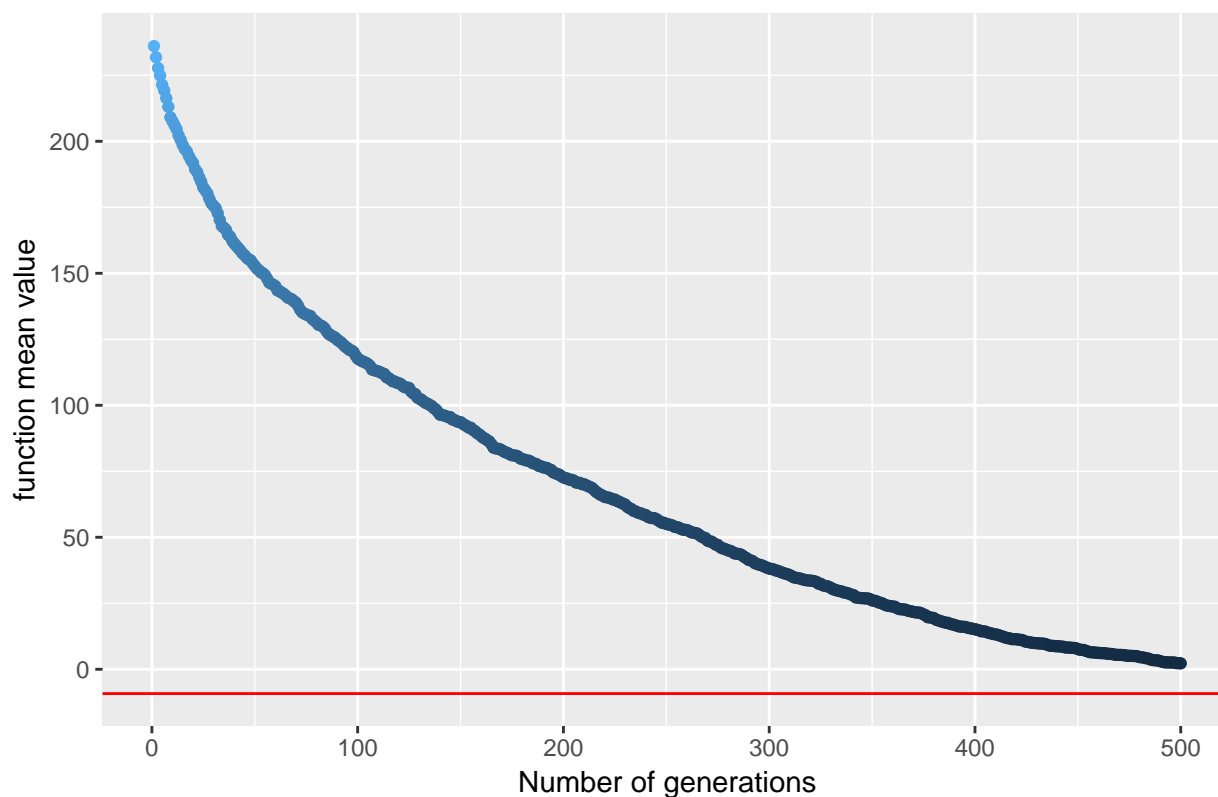# F2 with last gen mean: 9565.82575 and target value: −209.87999999
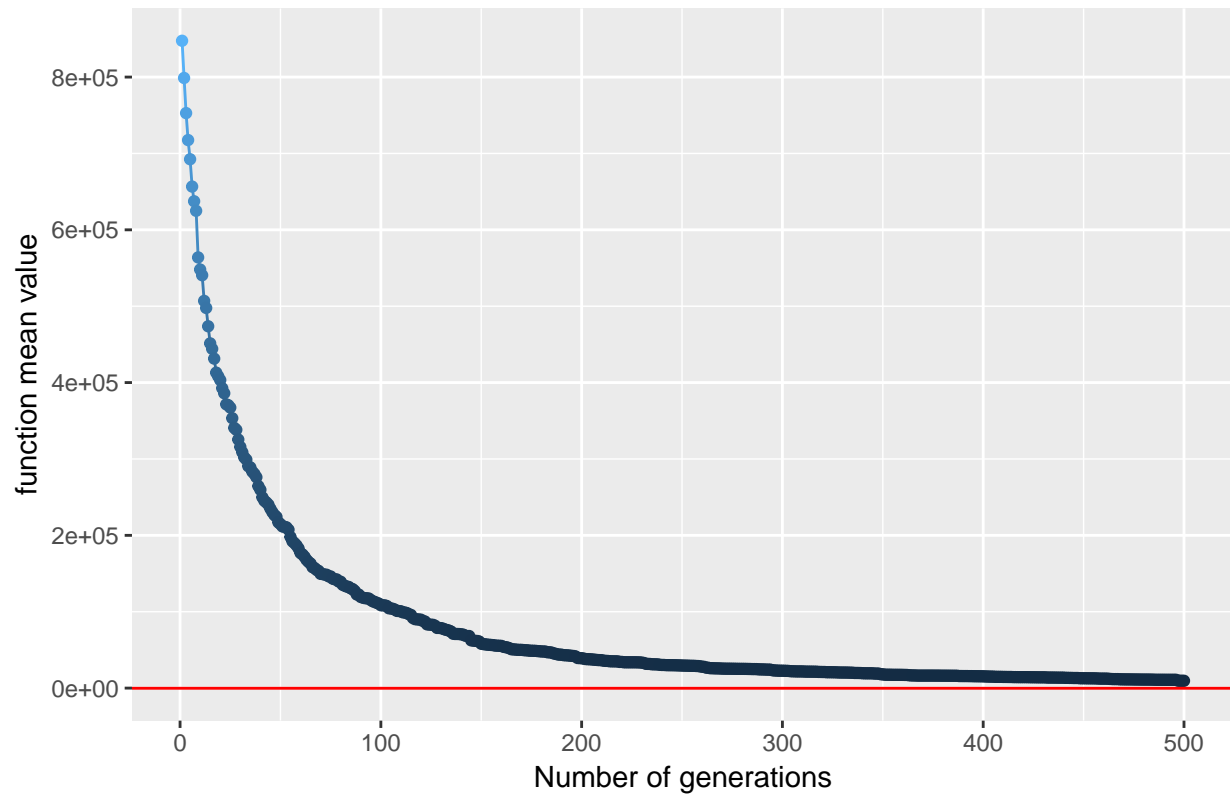
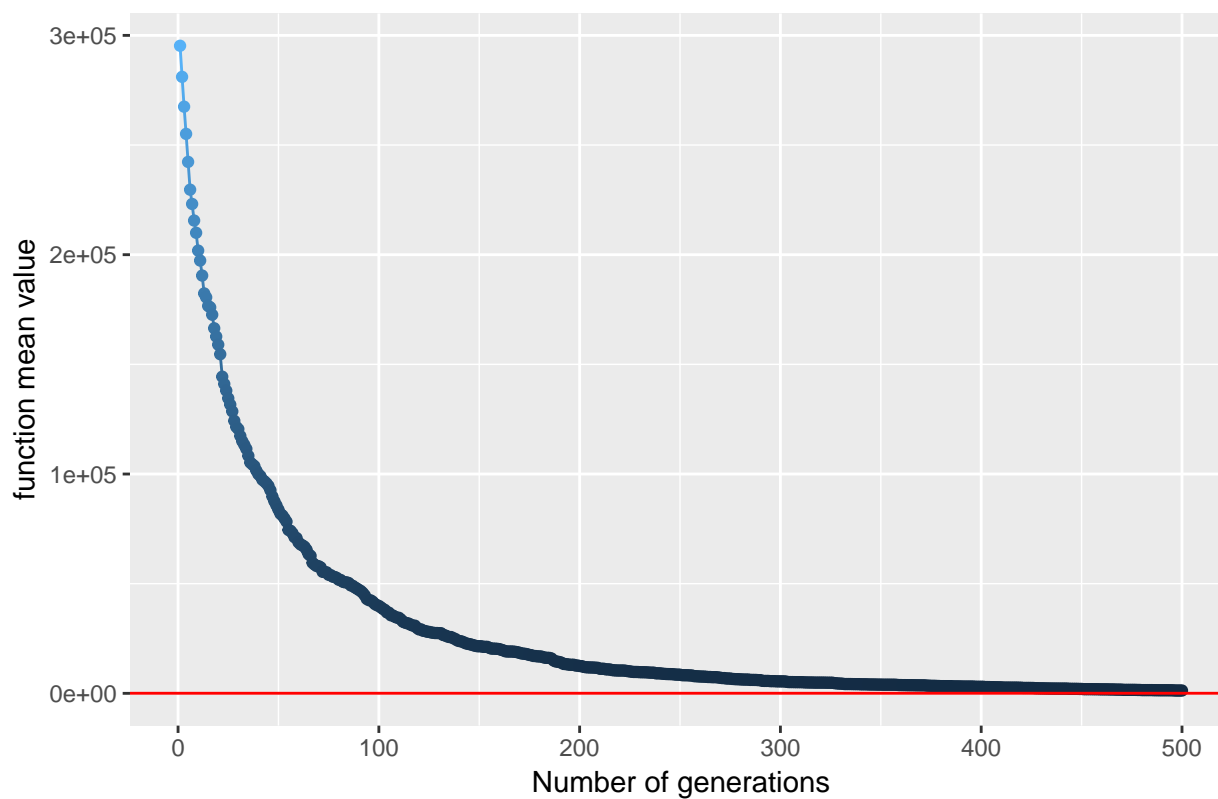F3 with last gen mean: −385.670425 and target value: −462.08999999

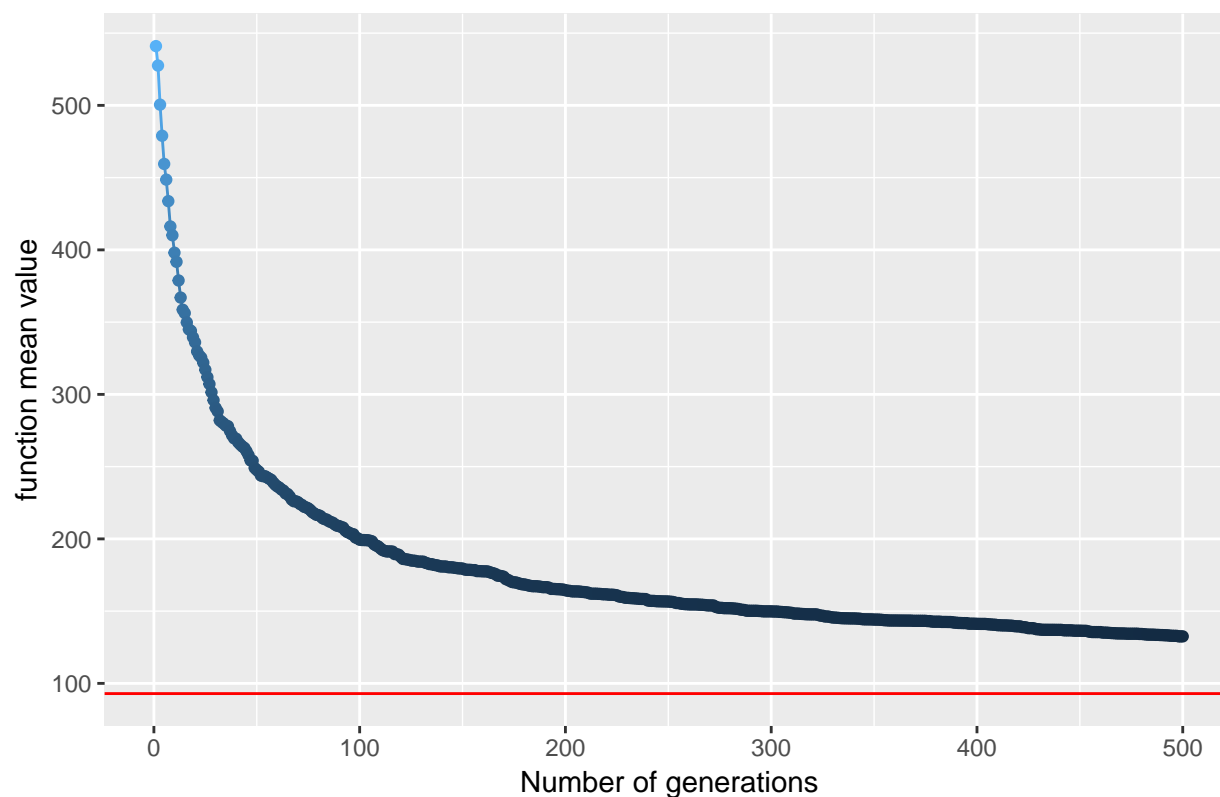F4 with last gen mean: −364.703825 and target value: −462.08999999

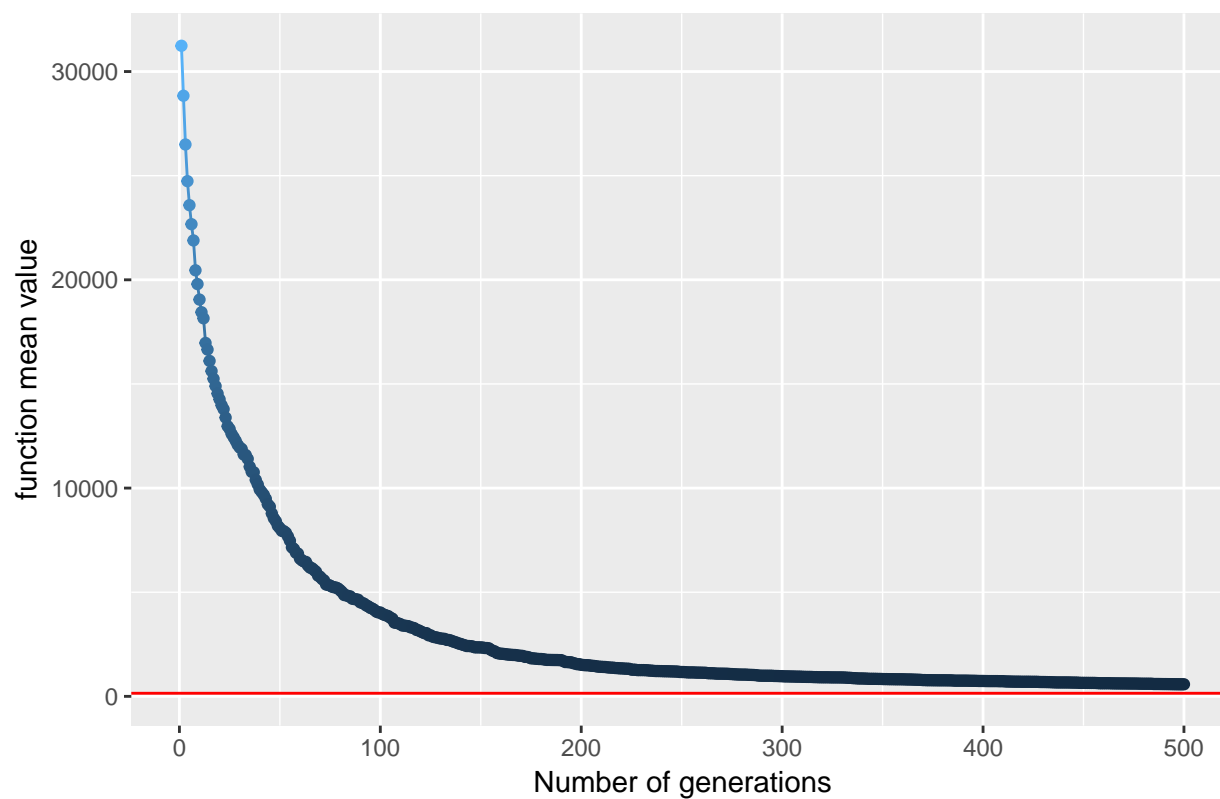F5 with last gen mean: 2.2424075 and target value: −9.20999999



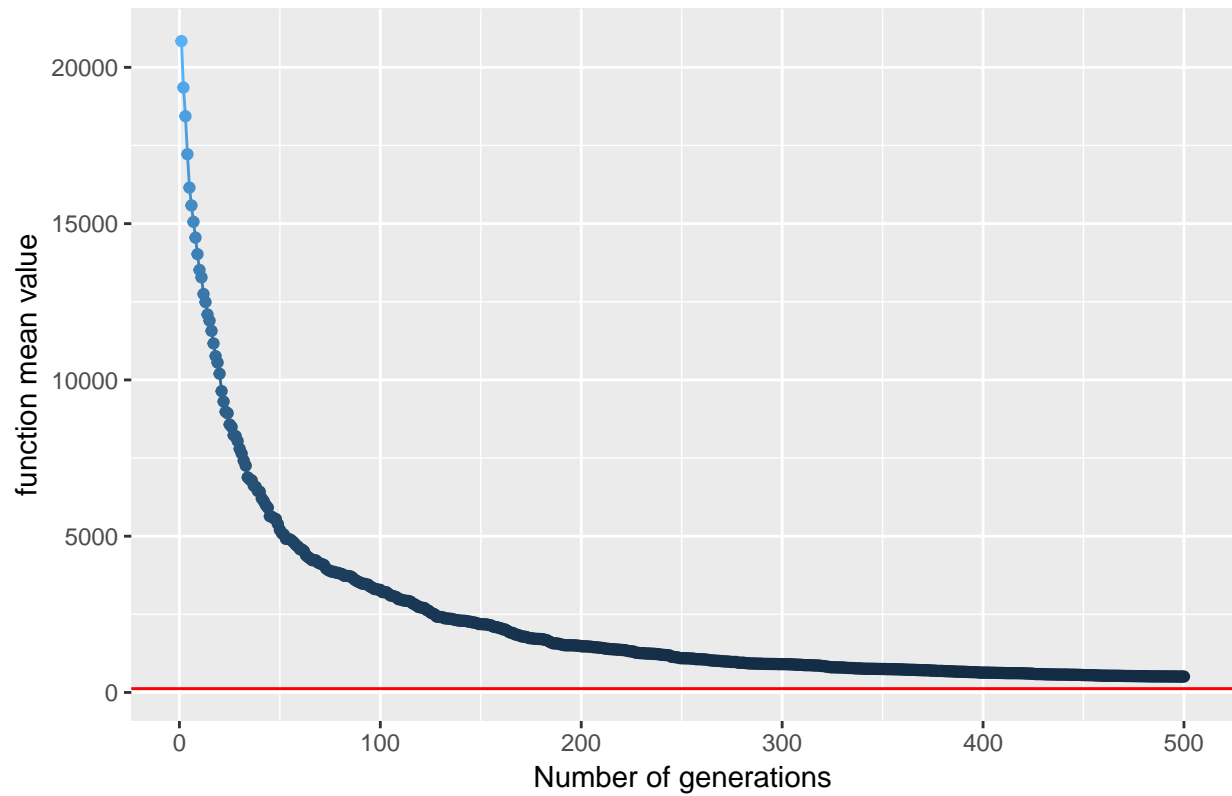F6 with last gen mean: 1278.83411 and target value: 35.90000001

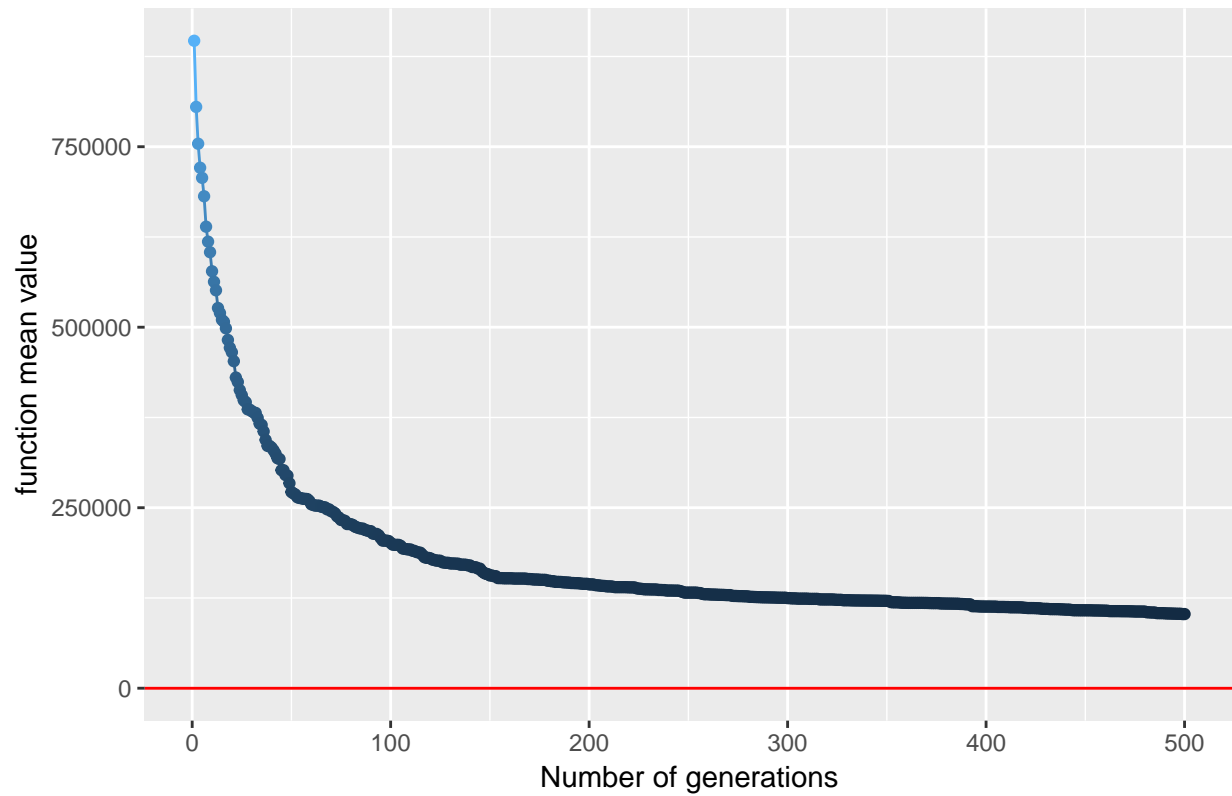F7 with last gen mean: 132.525825 and target value: 92.94000001

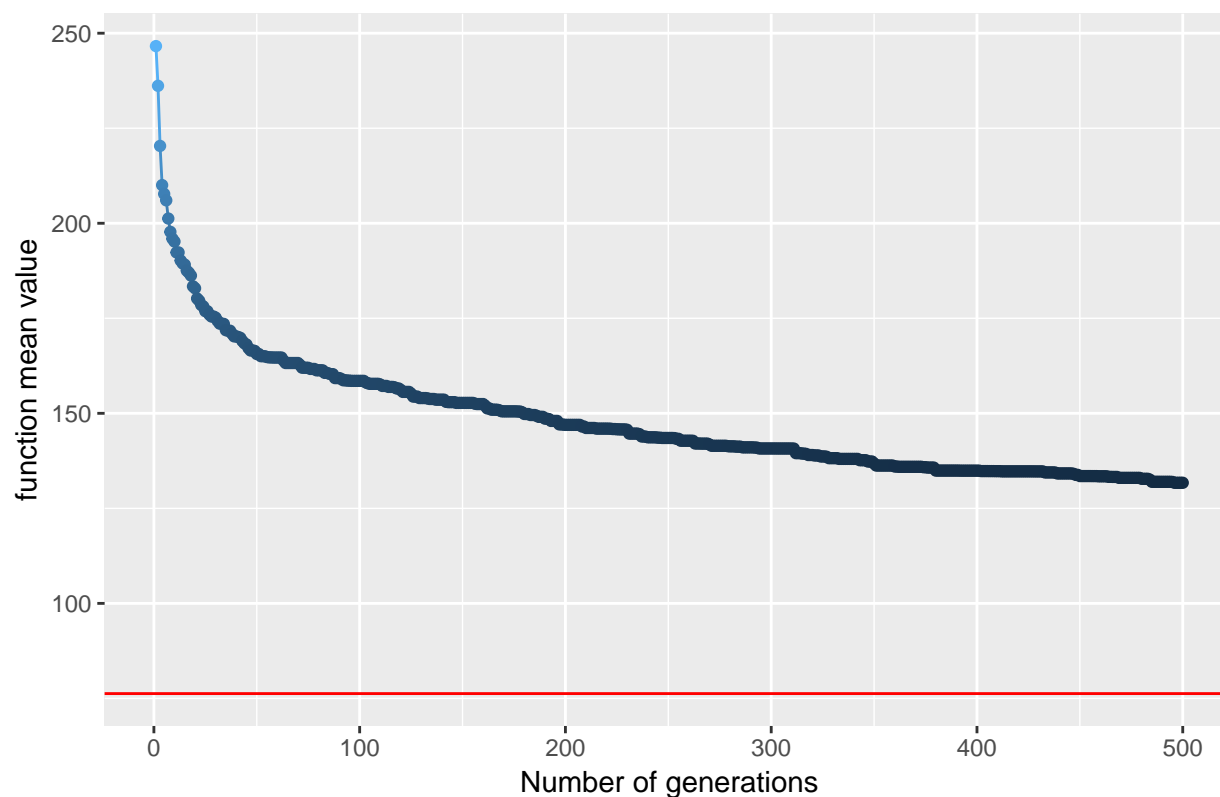F8 with last gen mean: 579.9307 and target value: 149.15000001

F9 with last gen mean: 507.859175 and target value: 123.83000001
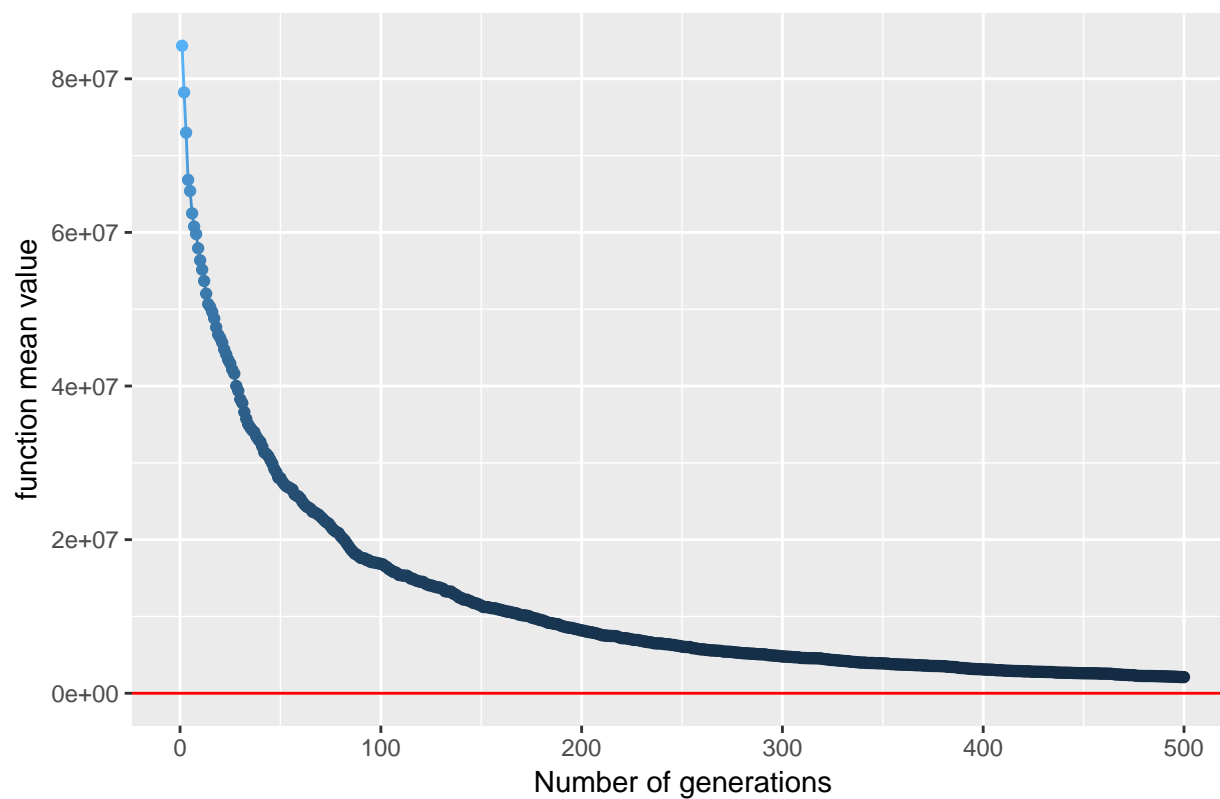
F10 with last gen mean: 102706.755 and target value: −54.93999999

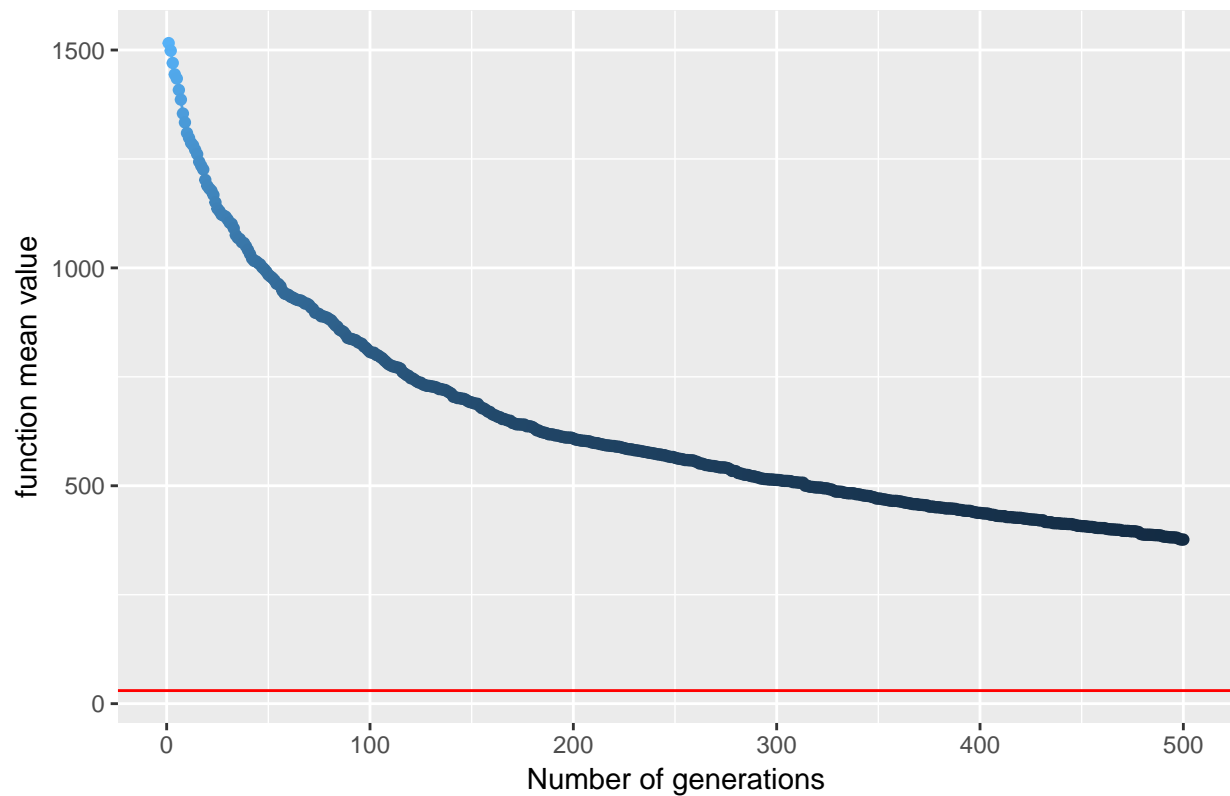F11 with last gen mean: 131.729125 and target value: 76.27000001



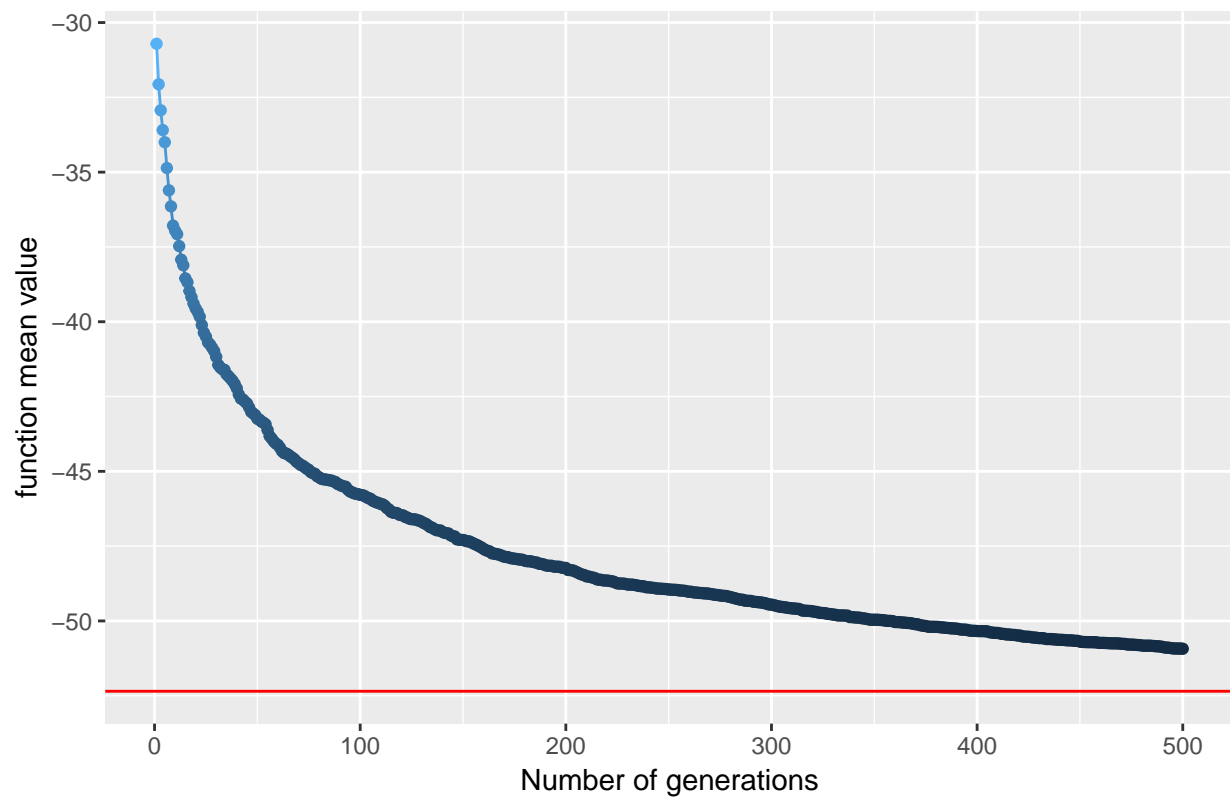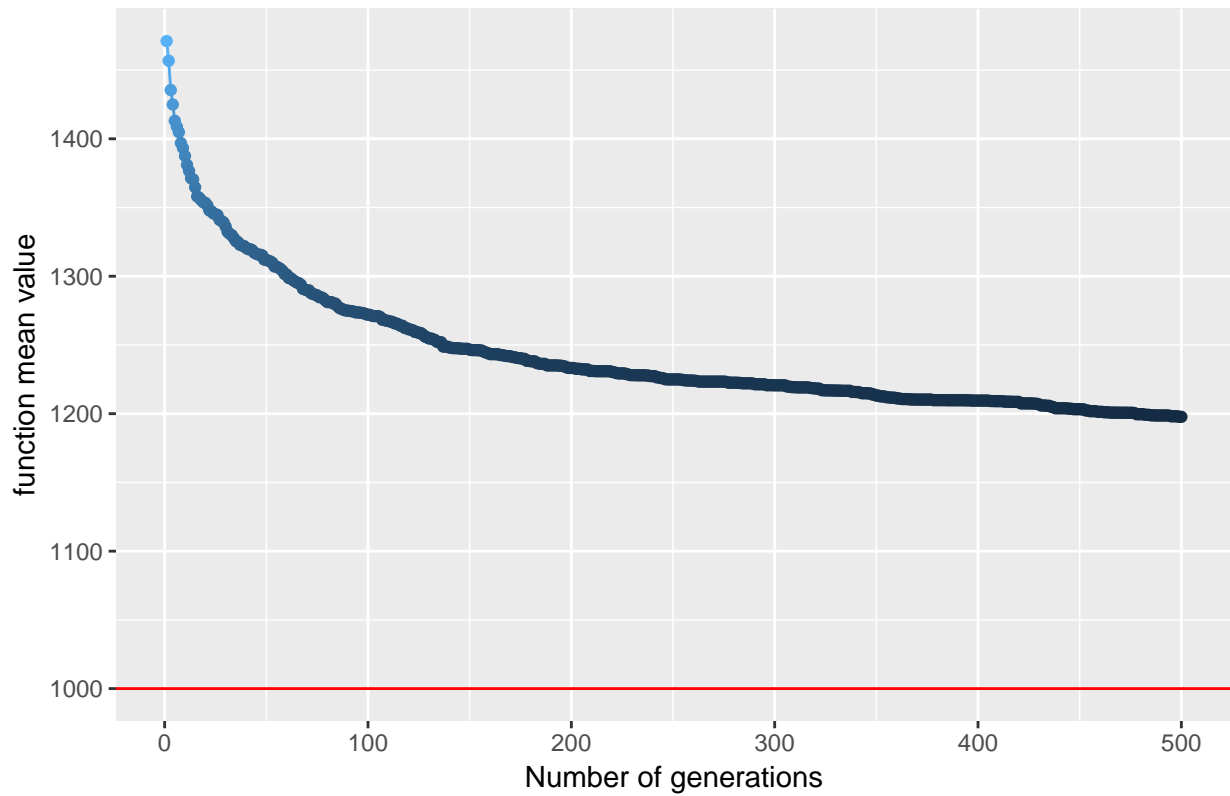F12 with last gen mean: 2105092 and target value: −621.10999999

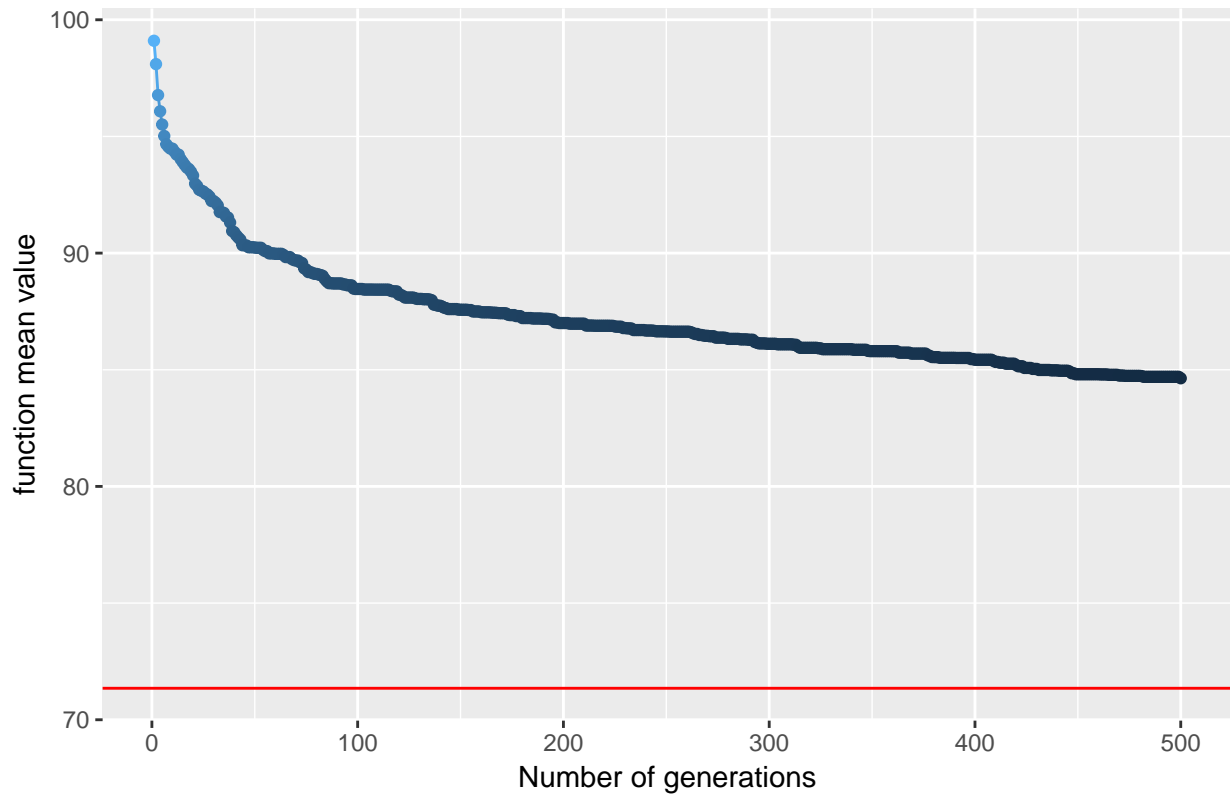F13 with last gen mean: 376.530875 and target value: 29.97000001

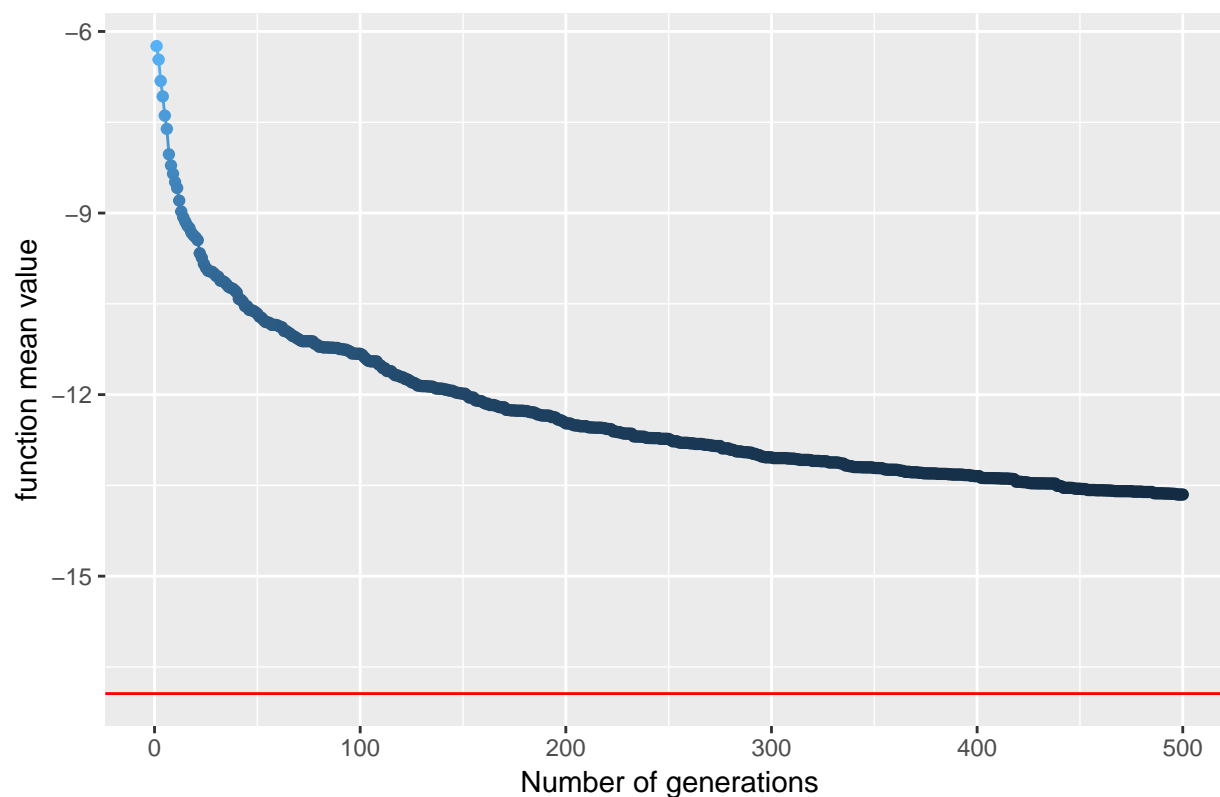F14 with last gen mean: −50.929 and target value: −52.34999999

F15 with last gen mean:  1197.7335 and target value: 1000.00000001
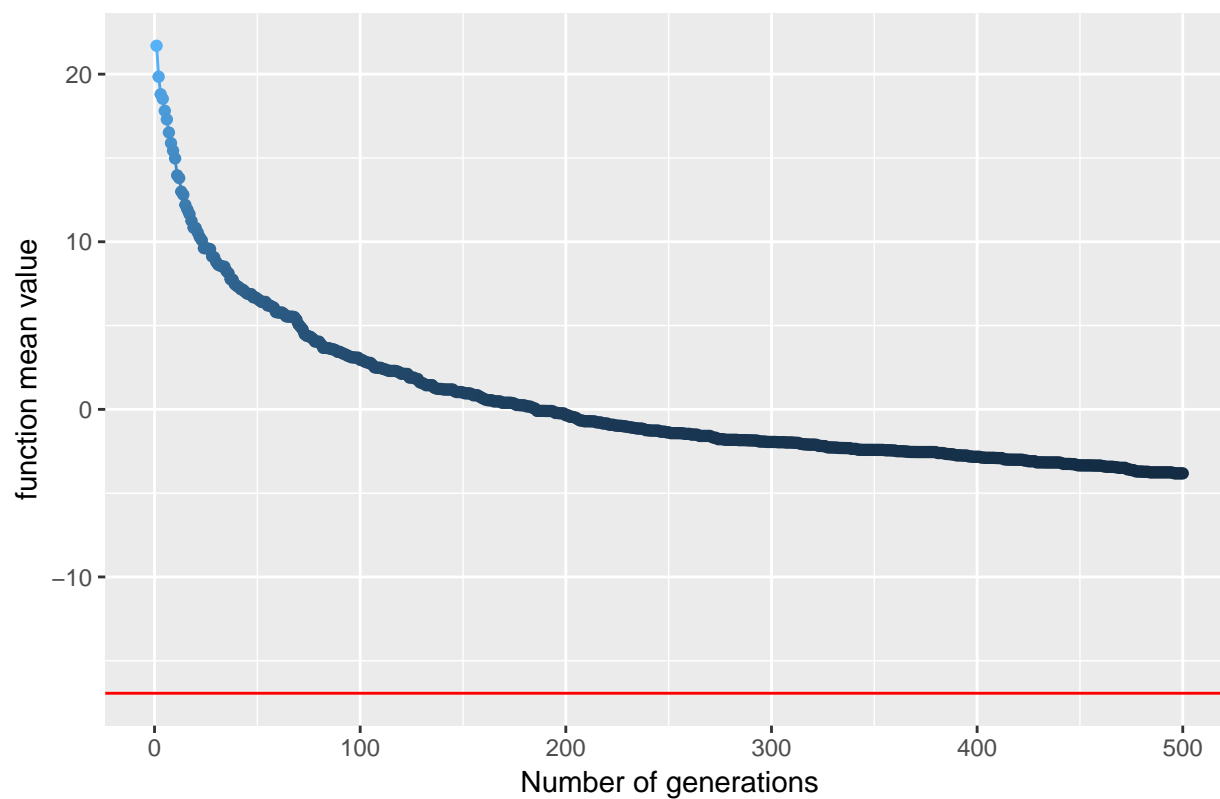
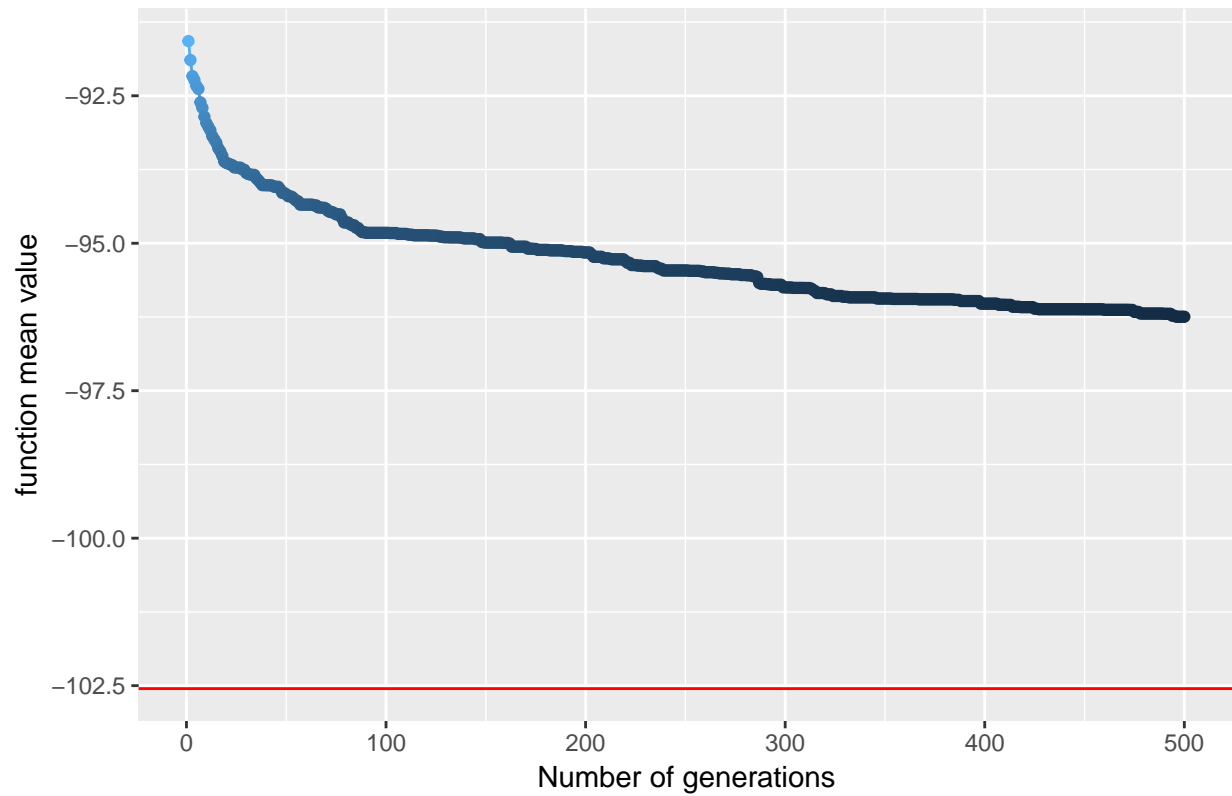F16 with last gen mean:  84.63501 and target value: 71.35000001

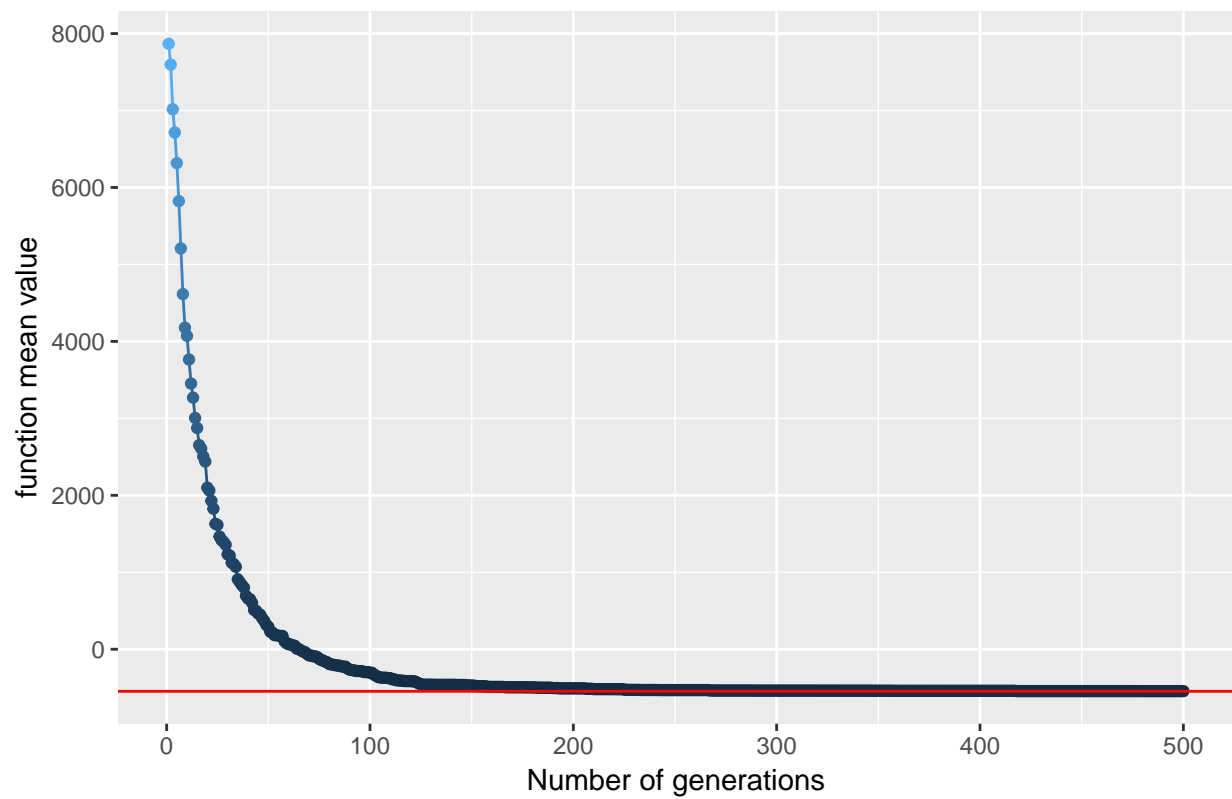F17 with last gen mean: −13.650825 and target value: −16.93999999

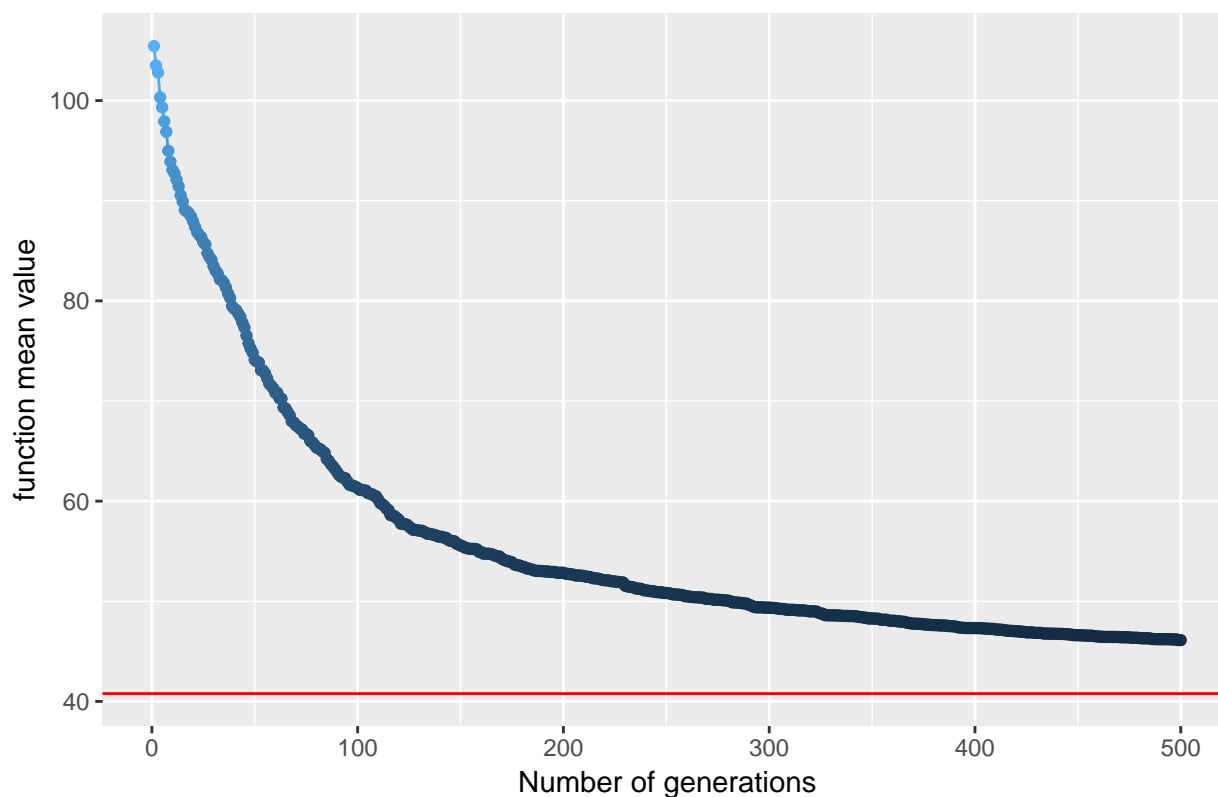F18 with last gen mean: −3.82025845 and target value: −16.93999999

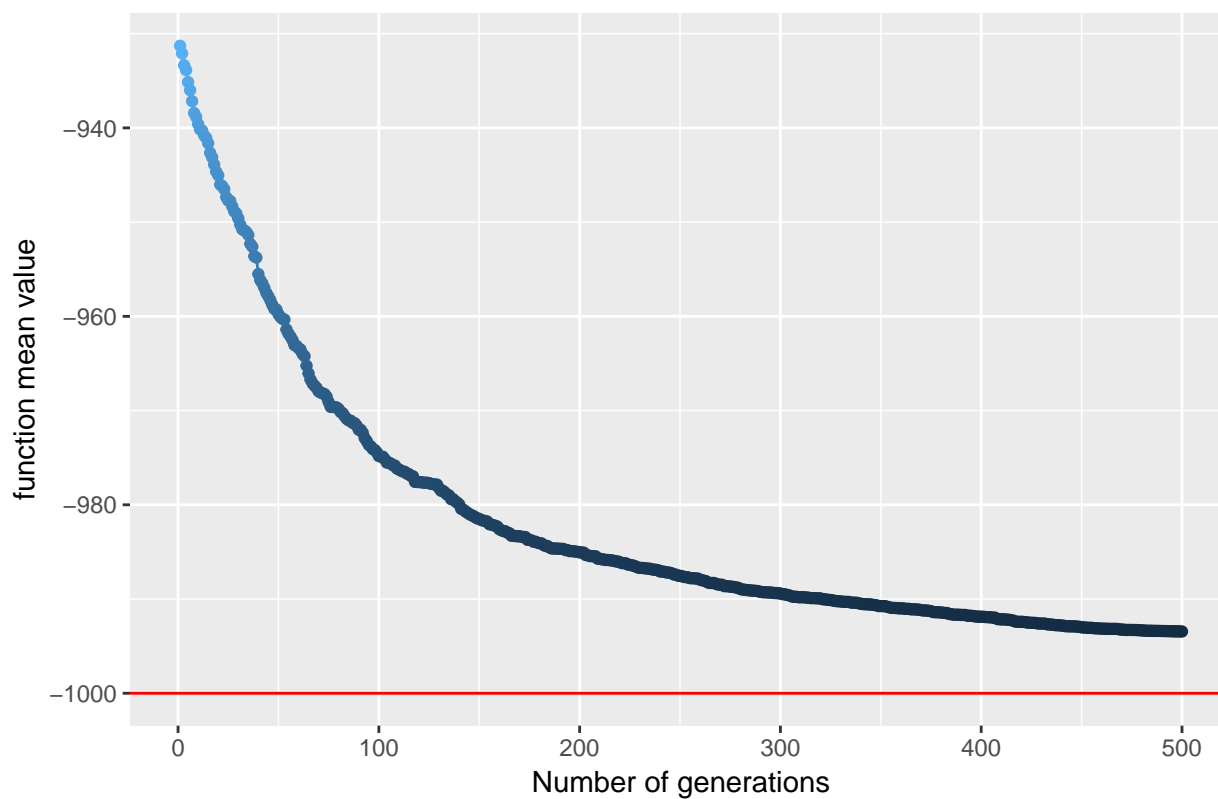F19 with last gen mean: −96.2458025 and target value: −102.54999999



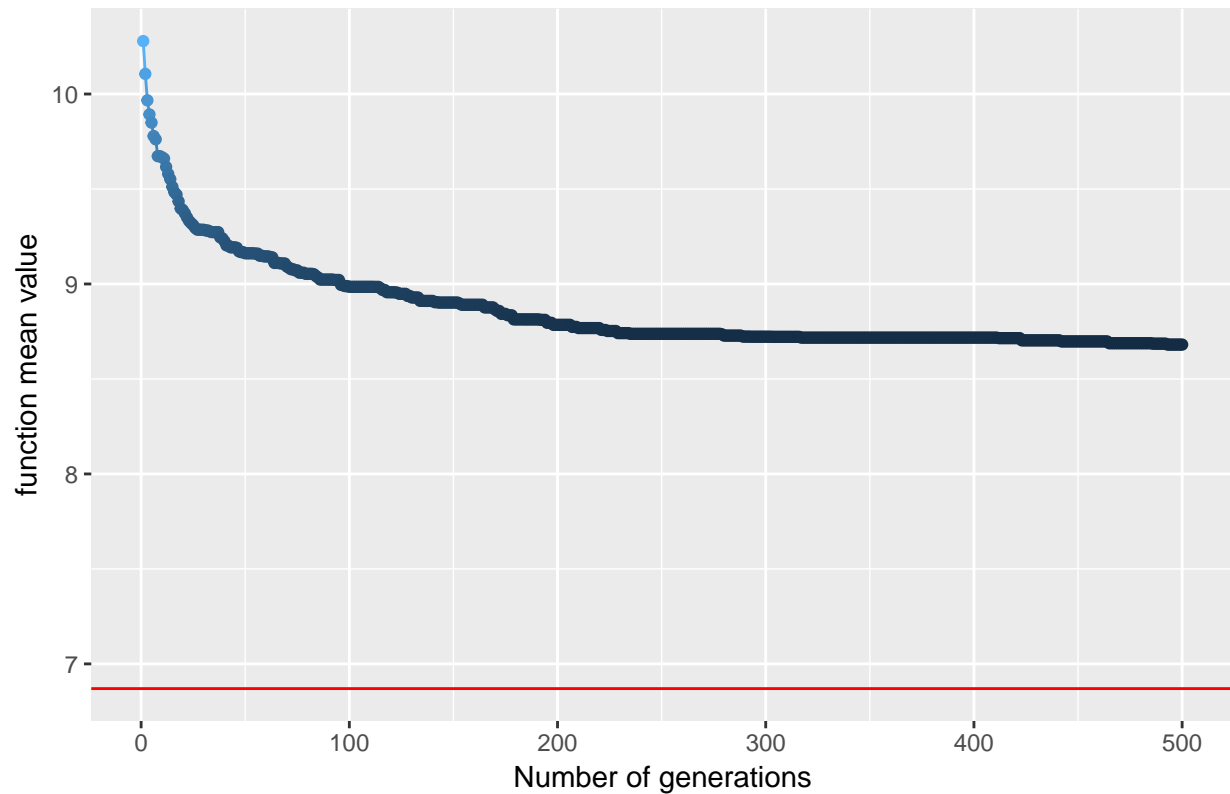F20 with last gen mean: −544.12135 and target value: −546.49999999

F21 with last gen mean: 46.1215025 and target value: 40.78000001

F22 with last gen mean: −993.44535 and target value: −999.99999999

F23 with last gen mean: 8.680885 and target value: 6.87000001



F24 with last gen mean: 311.100325 and target value: 102.61000001