Write up:

Task1 :

Step1:

Generate two lists of the random numbers for a list of Yi for both uniform and normal

We got y1 and y2

Step2:

Define two function for two types of ordering of Yi. The first one is with replacement and the Second one is without replacement.

For the first function IGD\_wr\_task1(y):

Since y is a list contains 105 elements

We run 105 iterations to update the new xk with 𝛾𝑘=1/k+1

For each iteration, we summarize the objective function at each xk

Then we add each value of objection function to a a list to get the history

The second function is wirte the same way

Step 3:

In order to make a general solution, we test two functions 100 times and take a average to observe the effect. For the ordering with replacement we draw in red line and for the ordering without replacement we draw in blue line

As we can see, the ordering without replace test decrease faster

Step4:

Brief prove of IGD\_wo\_task1 must converge to the true solution

=

n𝑥𝑁=(n−1)𝑥n−1+𝑦i==>𝑥n==

As we can see, the update formula gives us the optimal solution of x wjhich is the sample mean.

Task2