MLN ASSIGNMENT 3 REPORT

Problem 1a:

The results obtained are given below:

For graph 1

No. of votes for A = 4937

No. of votes for B = 5063

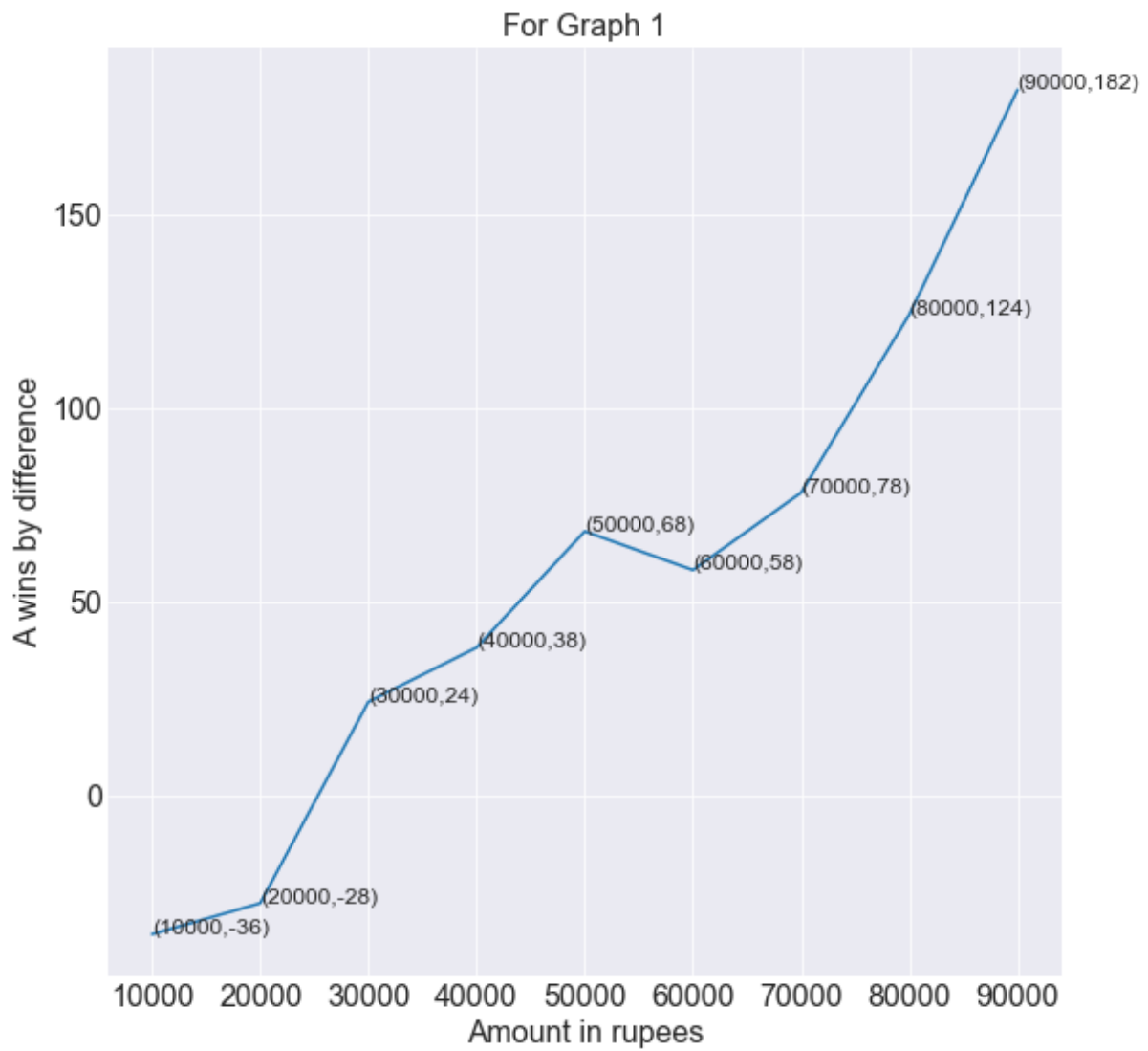In Graph 1 contestant B wins by 126 votes
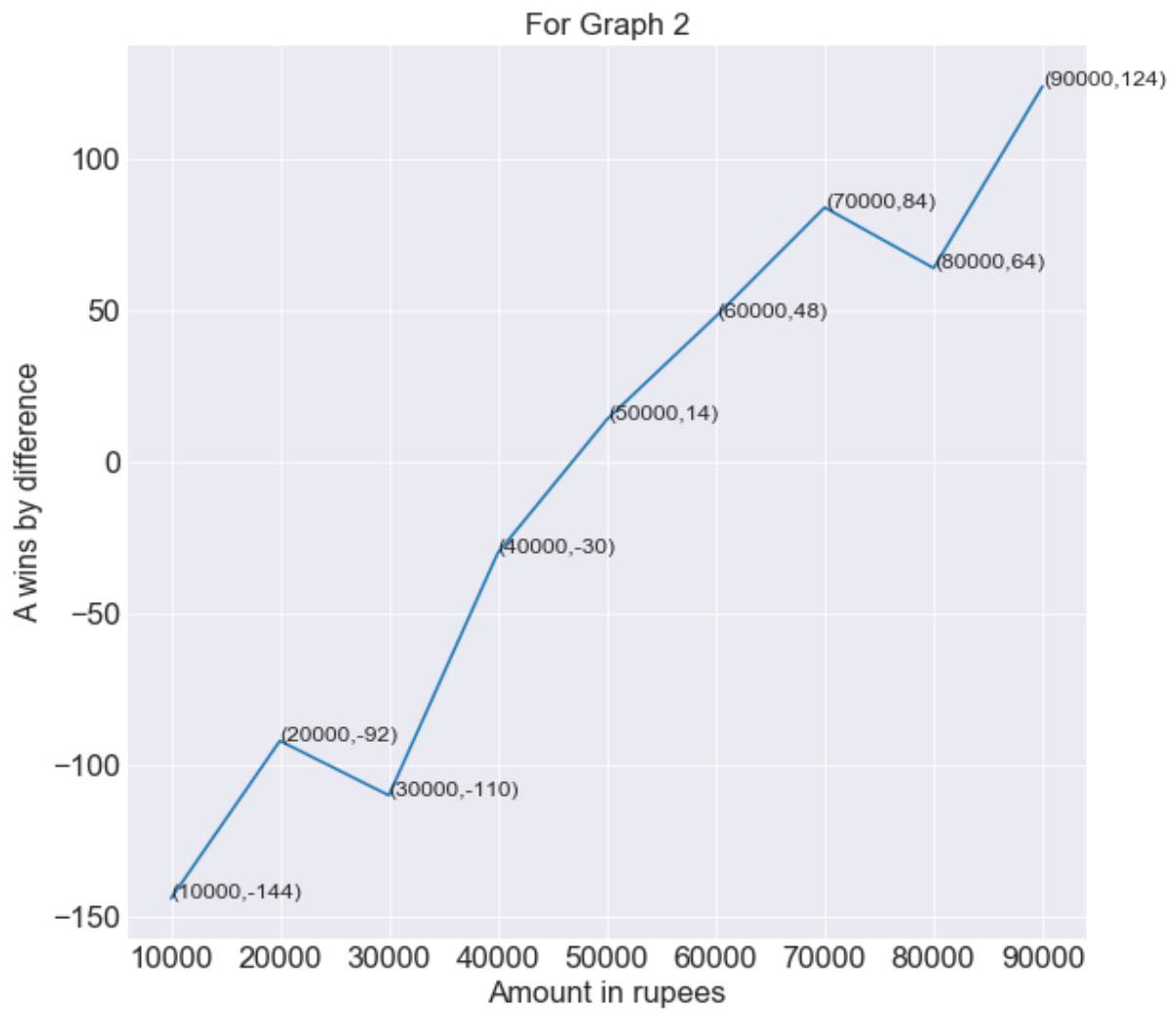

For graph 2

No. of votes for A = 4913

No. of votes for B = 5087
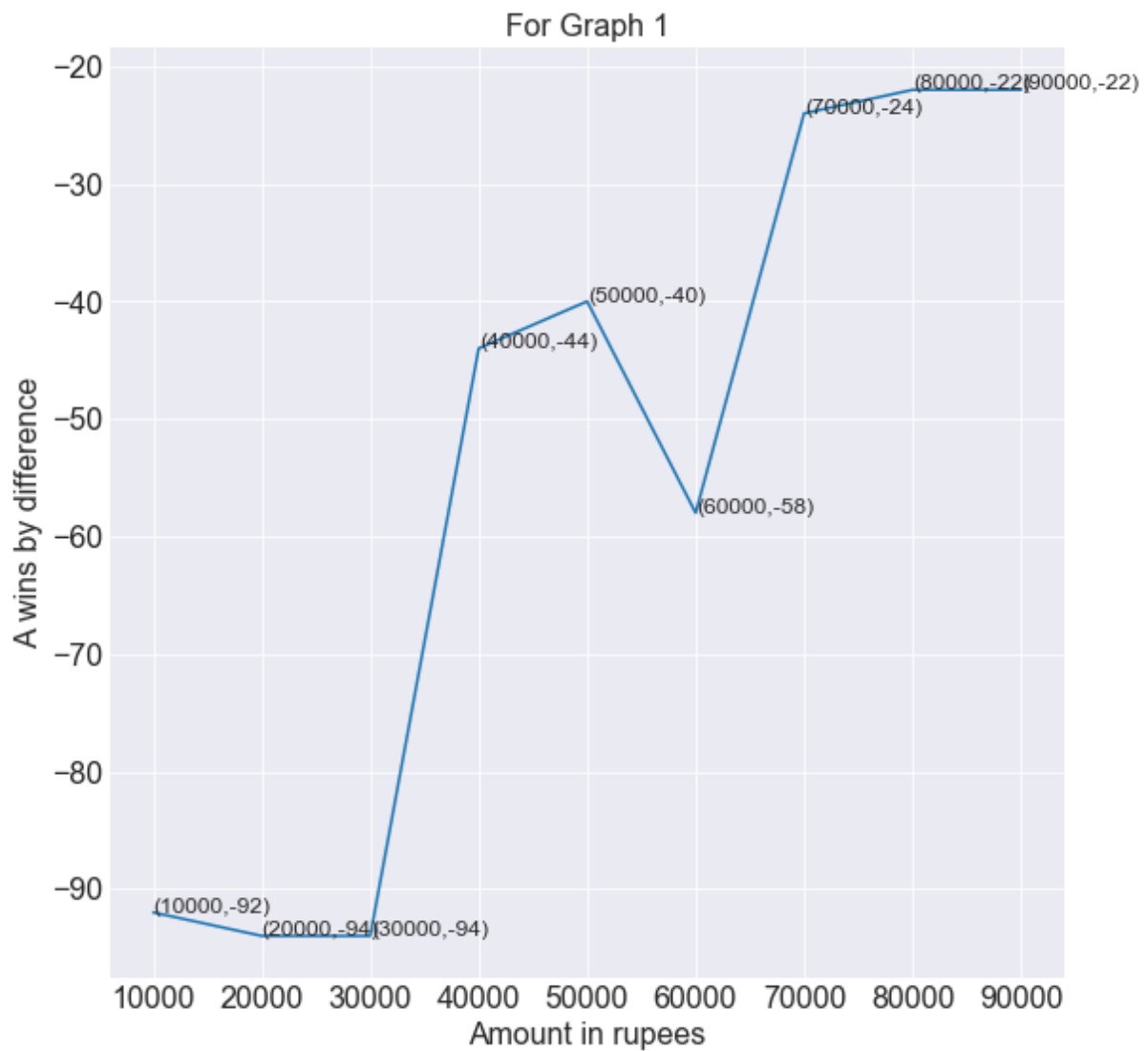
In Graph 2 contestant B wins by 174 votes

Problem 1b:

For Graph 1

Minimum amount that can be spent for A to win elections in Graph 1 = 30000

For Graph 2

(90000,124)

(70000,84)

(80000,64)

(60000,48)

(50000,14)

(40000,-30)

(20000,-92)

(30000,-110)

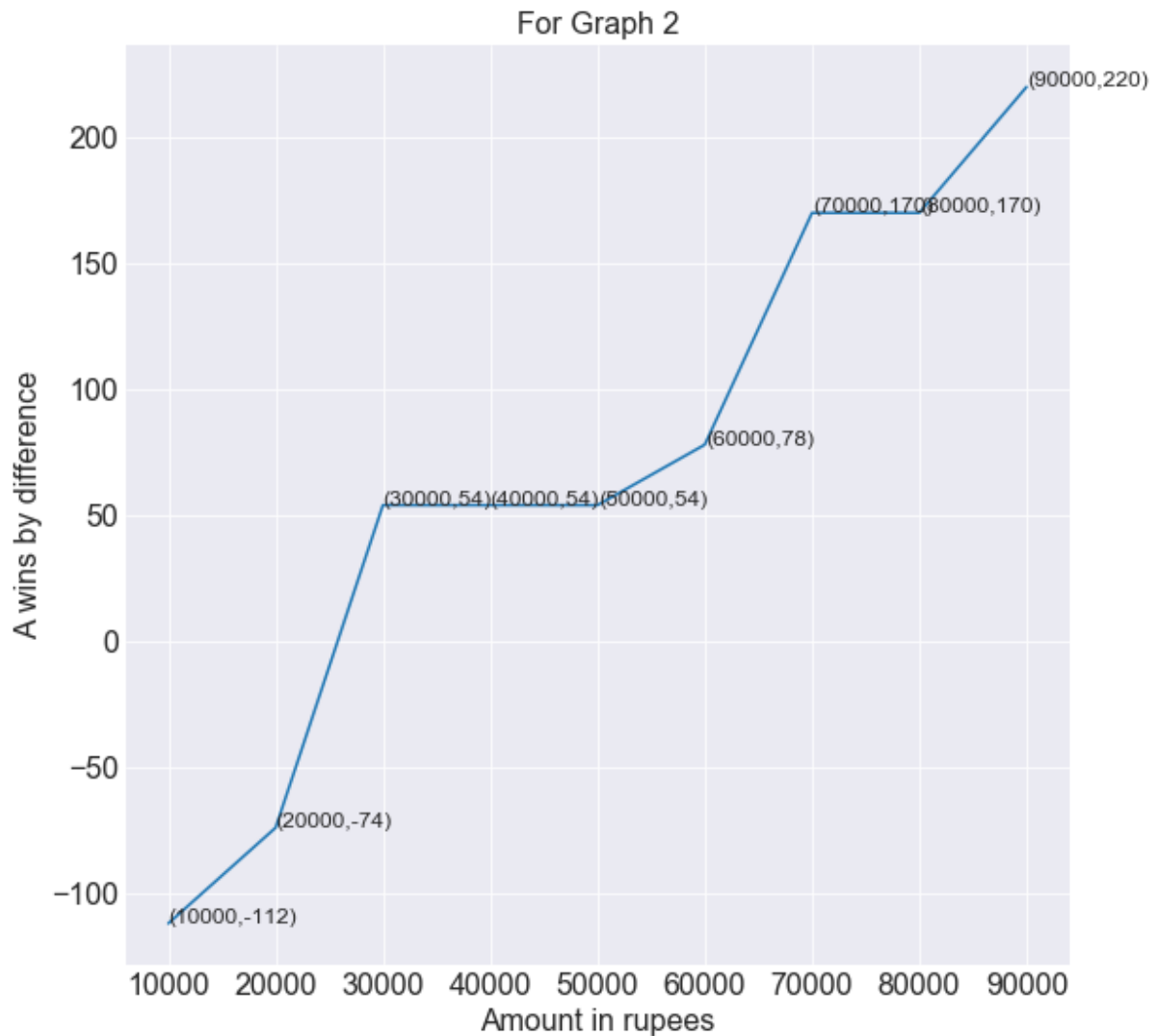(10000,-144)

A wins by difference

Amount in rupees

Minimum amount that can be spent for A to win elections in Graph 2 = 50000

Problem 1c:

For Graph 1

Not possible for A to win election even after using max amount i.e. Rs. 90000

For Graph 2

Minimum amount that can be spent for A to win elections in Graph 2 = 30000

Problem 1d:

**Reason of result of Problem 1b:**

The average degree of the nodes from 3000 to 3099 in the 2 Graphs are:

For Graph 1 = 20.19

For Graph 2 = 18.27

So, the nodes 3000-3099 are more influential in Graph 1 as compared to that in Graph 2 as on an average as they have more no. of friends in Graph 1than in Graph 2. Therefore, there is more impact on swaying nodes 3000-3099 to vote for A using TV advertisement. Therefore, minimum amount required for Graph 1 i.e. 30000 is lesser than that required for Graph 2 which is 50000.

Reason of result of Problem 1c:
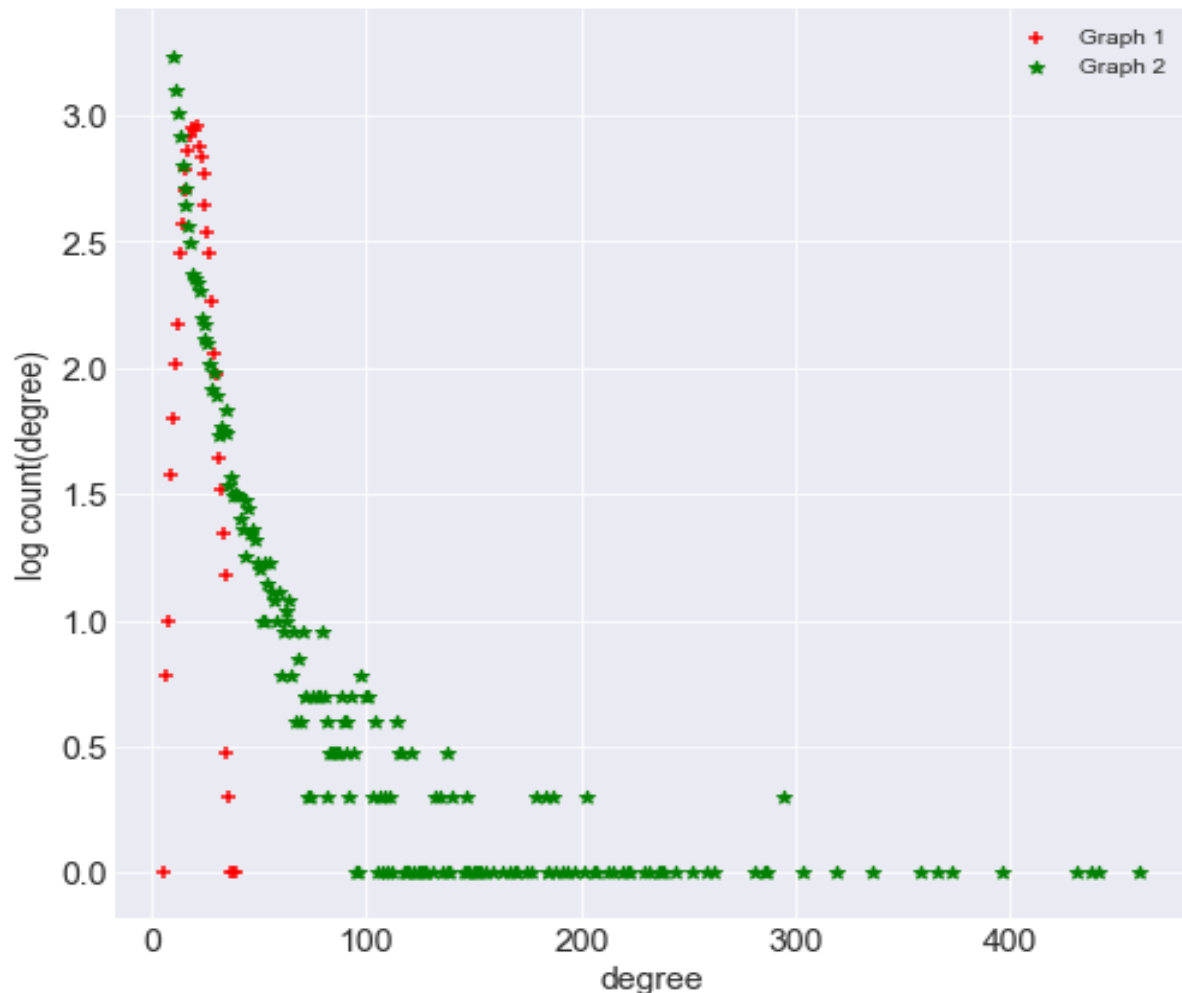
Fig: Degree distribution plot for the 2 graphs

The degree distribution plots for the 2 graphs are shown in the above figure.

It can be seen from the degree distribution plot that the top k highest degrees in Graph 1 are lesser than top k highest degrees in Graph 2.

The top 9 highest degree nodes selected from Graph 1 have degrees ranging from: 39 to 34

The top 9 highest degree nodes selected from Graph 2 have degrees ranging from: 460 to 336

Therefore, when dining with big shots is done. In case of Graph 2 the people that are swayed to vote for 'A' are the ones with a large number of friends. Now

when the Graph goes through a decision period, more and more people who were undecided now decide to vote for A due the highly influential people.

While this is not the case with Graph 1 as the big shots that are selected have comparatively very less no. of friends as compared to Graph 2. So, during the decision period comparatively lesser no. of undecided people decide to vote for A.

Strategy to spend Rs. 90000:

1. **For Graph 1:**

   For Graph 1 I will spend Rs. 90,000 completely on T.V. advertisements because whatever money I spend on dining with big shots is not useful and it will be just wasted. For dining with big shots, it is not possible to win elections even after spending the complete Rs. 90,000 on the dinner. So, it is better to spend even money excess of Rs. 30,000(money sufficient for A to win) on T.V. advertisements as will lead to increase in the winning votes difference for A.

2. **For Graph 2:**

   For Graph 2 I will spend Rs. 60,000 on T.V. advertisements and Rs. 30,000 on Dining with Big shots.
   The reason for not spending Rs. 50,000 on T.V and Rs. 40,000 on dinner is that the gain in votes when spending increased from 50,000 to 60,000 on T.V. is of 34 votes while there is a gain of 0 votes when dinner spending increased from 30,000 to 40,000.

Problem 2
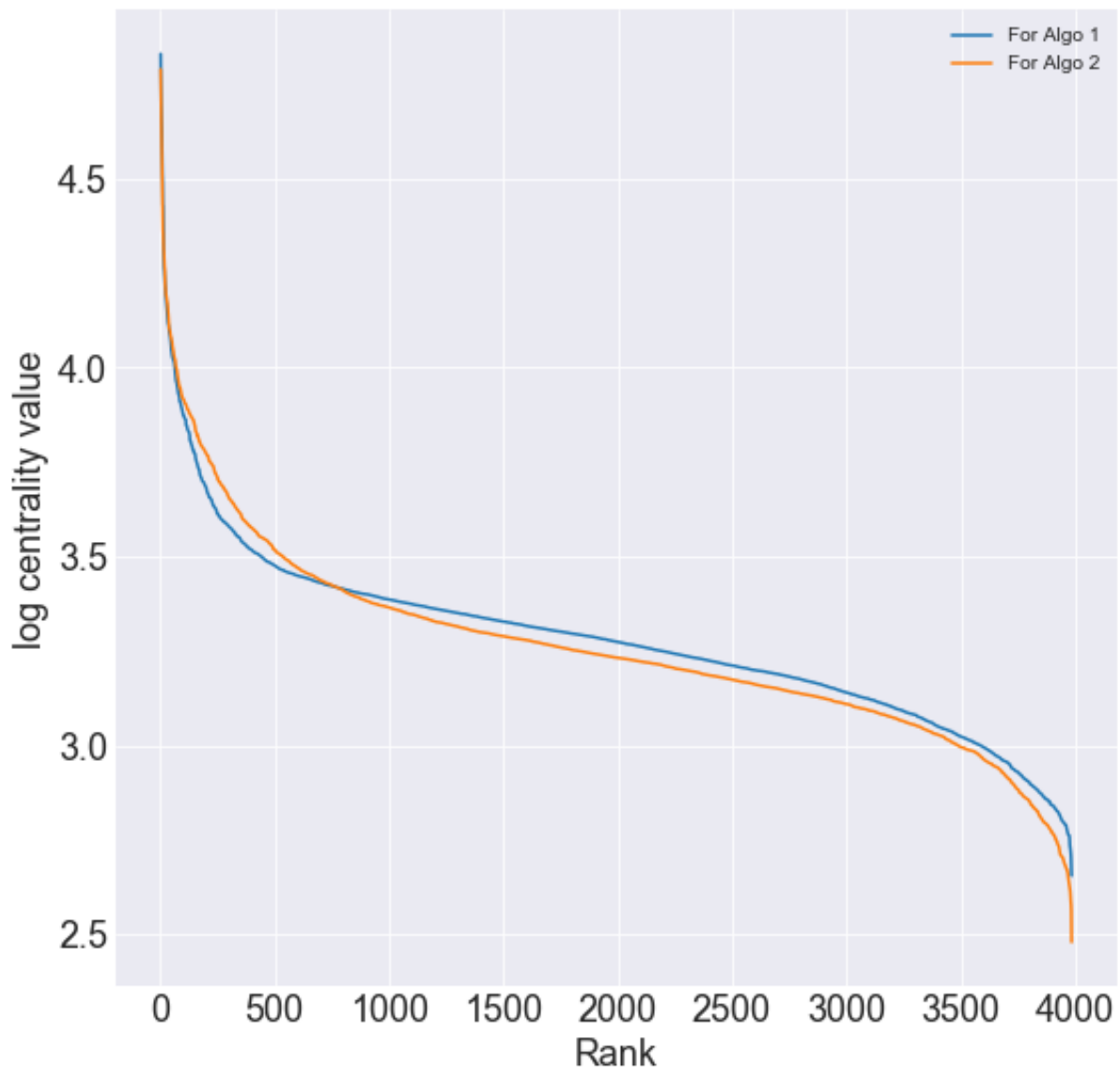
Fig: Curves for Algo 1 and 2 overlaid on the same plot

From the curves it can be seen that for around the top 100 edges according to centrality values, the centrality values from Algo1 and Algo2 are same. Further also for around 600 nodes the values by Algo 2 are higher than that from Algo 1. Later on, the centrality values for the edges from Algo 2 are only slightly lesser than the ones obtained from Algo 1.

Therefore, we can say that Algo 2 which is an approximation of Algo 1 is also a good algorithm for finding betweenness centrality values. Also, Algo 2 takes lesser time to run than Algo 1.