Student name: Steven Xie

Student number: 998979627

Program & Department: MEng MIE

# Homework 1

Problem 1.

1. Given X is uniformly distributed in [2,8]

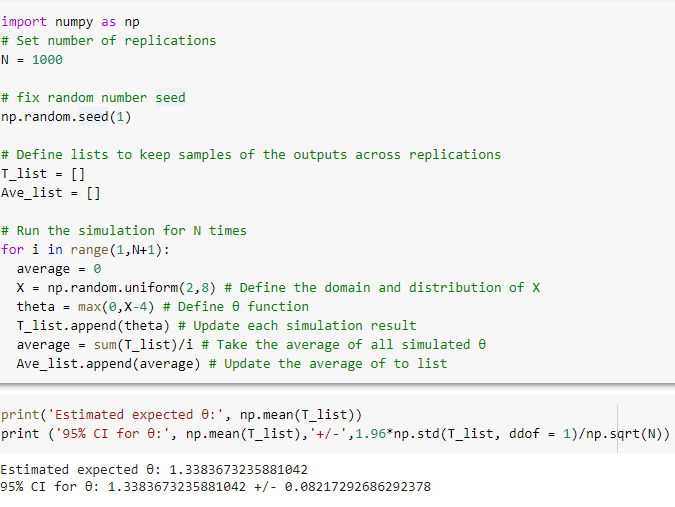
θ = E[(X - 4)+] = P(2≤X≤4) × 0 + P(4<X≤8) × E[(X-4)]

= × 0 + × (E(X) -4)

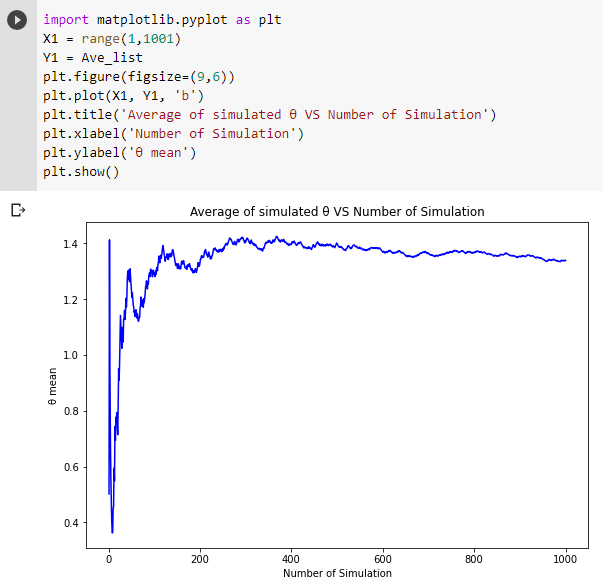
= – 4)

=

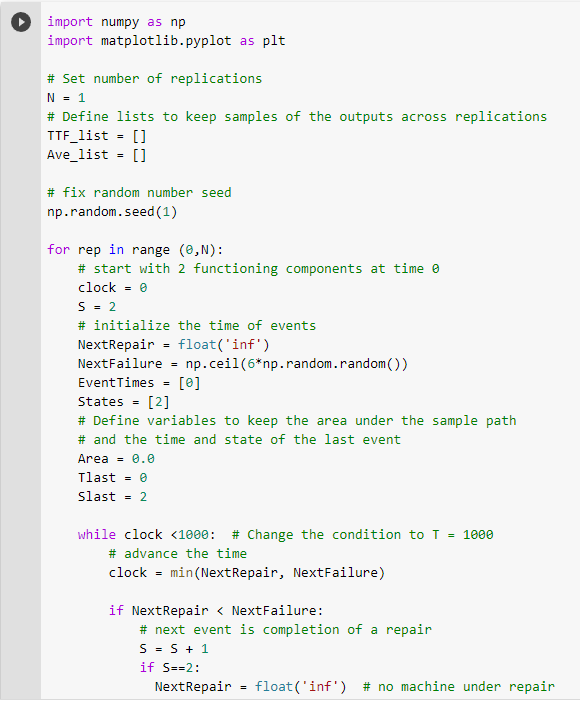
1. Shown in code

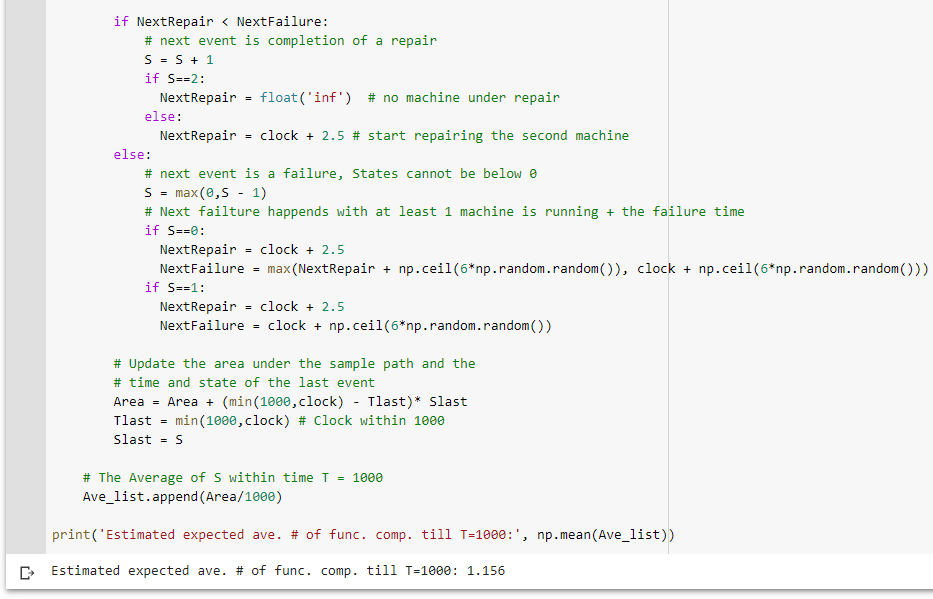


1. In the plot we can see that the average of simulated θ converge to the computed E(X) = 1.33

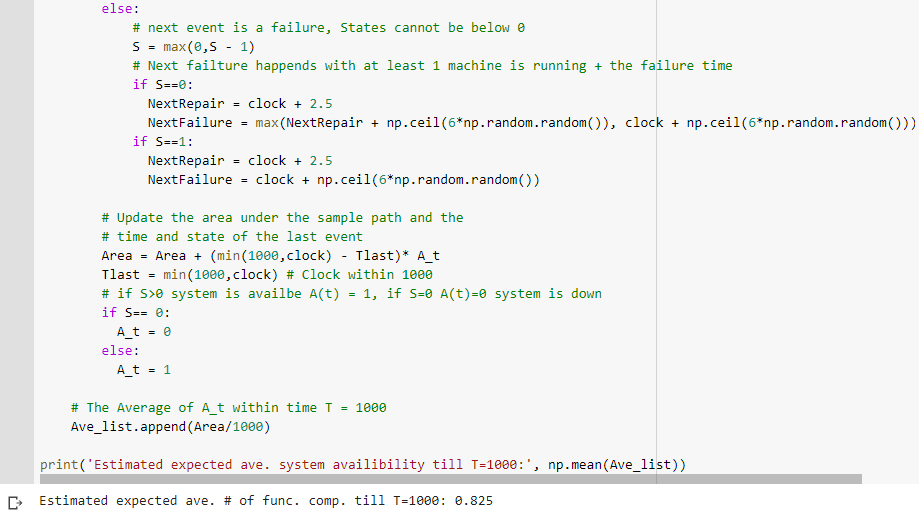
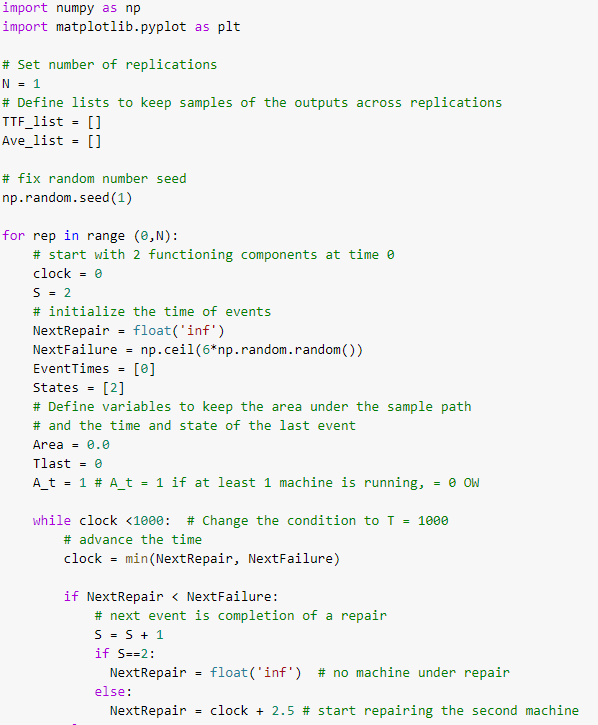


Problem 2

(a). Shown in code. With 1 replication before T = 1000 the average number of functional components is 1.156.



(b). Model is almost identical as in (a) except that the Slast is replaced with A\_t which is a binary variable. The expected average system availability time till T=1000 is 82.5%.



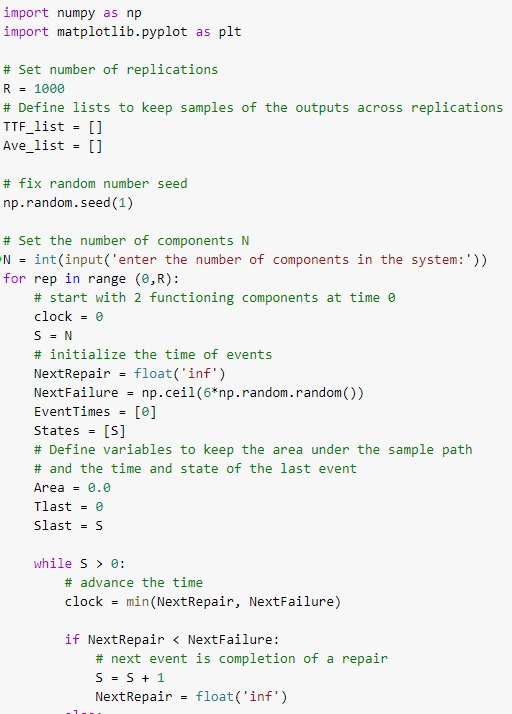
(c). The estimates for T=1000 and T=3000 are very close (1.156 vs 1.161 and 82.5% vs 83.4 %). Therefore, when we simulate a system with a relatively large number, the estimations of the average of the simulations will converge.

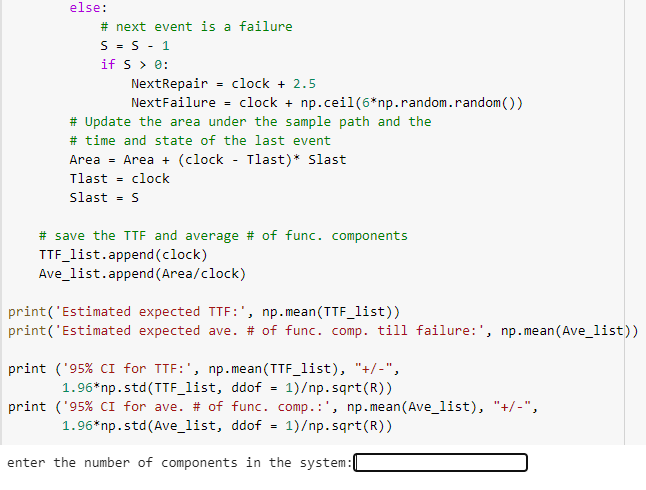




Problem 3

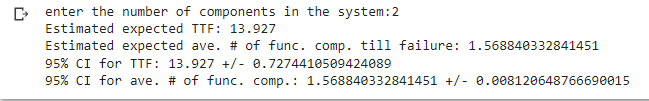
Code Shown below.



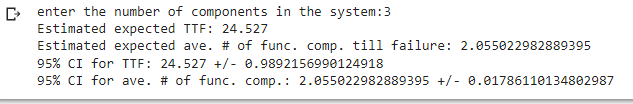


Result shown below:

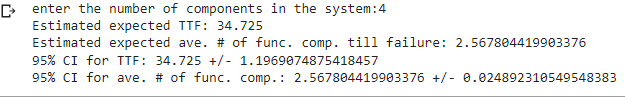
N = 2: TTF = 13.927 +/- 0.727



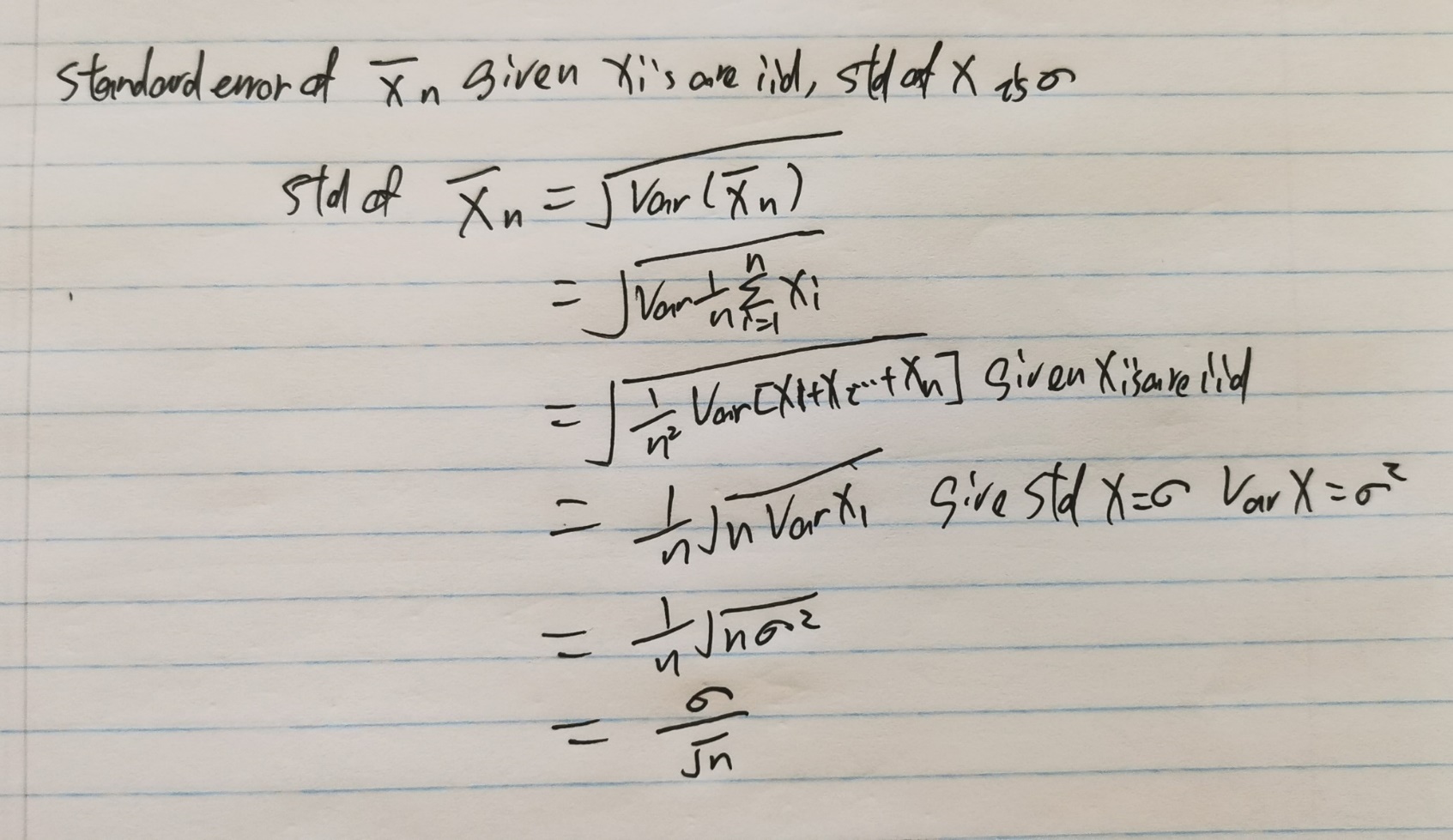
N = 3: TTF =24.527 +/- 0.989



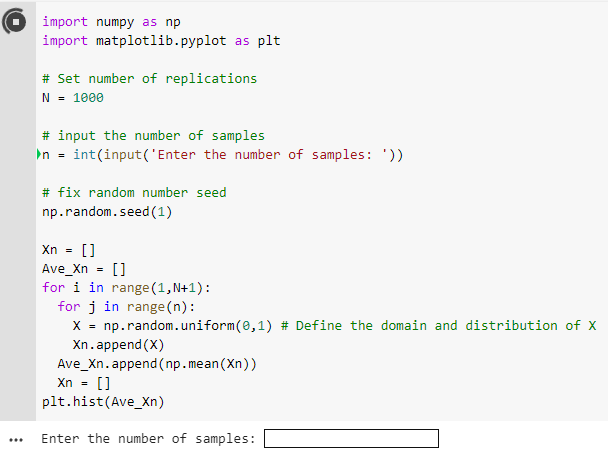
N = 4 TTF= 34.725 +/- 1.197



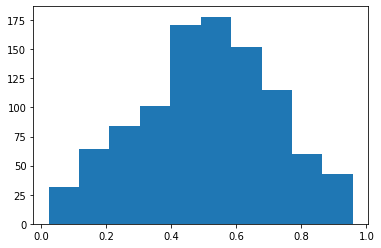
Problem 4



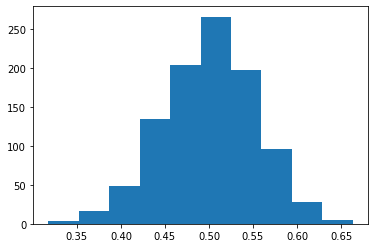
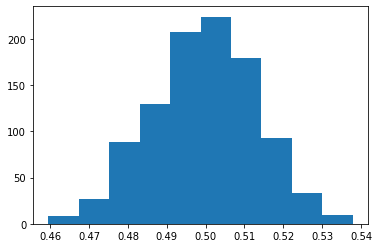
Problem 5



n = 1 n= 2



n = 30 n=500

As n increases, the means of samples become closer to the expected value of mean = 0.5, the variances become smaller. The distribution of means of samples become more likely to be a normal distribution with decreasing variance as n increases.