1.b)

Iterative Approach: theta(n)

Divide And Conquer Approach: theta (log n)

Divide And Conquer Recurrence:

{

theta(1) if n = 1

T(n) = T(n/2) + theta(1) + theta(1) otherwise

}

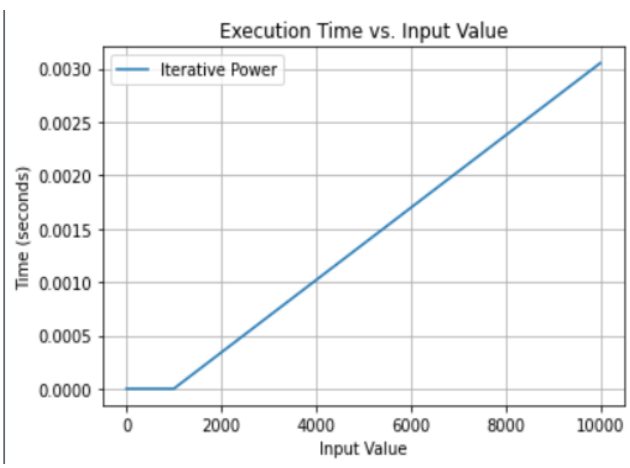
By using the master's theorem:

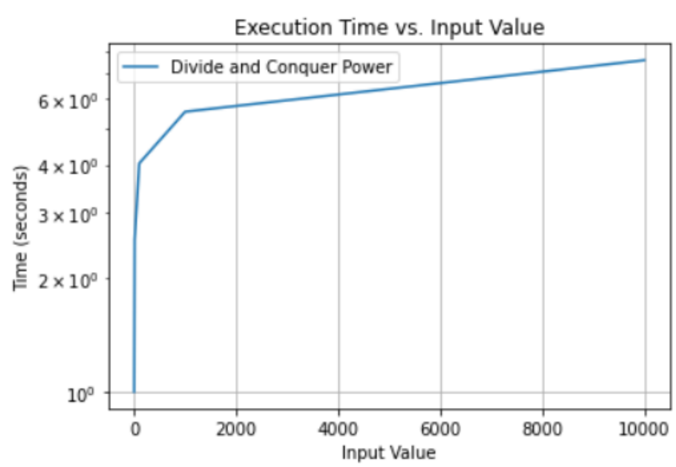
a = 1, b = 2, f(n) = theta(1)

n^(log_b(a)) = n^(log_2(1)) = n^0 = 1

T(n) = theta(n^(log_b(a)) * log(n)) = theta(log (n))

1.c)





The Iterative approach has a linear growth rate since it depends on the size of the input and the Divide and Conquer approach has a logarithmic growth rate since it only worries about half the size of the input.

1.d) Yes since the growth rates of both approaches match in both the experimental test and the recurrence equation.

2.b)

{

theta(1) if n = 1

T(n) = 2T(n/2) + theta(n log (n)) otherwise

}

By using the master's theorem:

a = 2, b = 2, f(n) = n log (n)

n^(log_b(a)) = n^(log_2(2)) = n

T(n) = theta (n^(log_b(a)) * log(n)) = theta (n log (n))

2.c)

The Divide and Conquer approach has a n log n growth rate.

The empirically observed running time and the predicted running time both equal O(n log n)