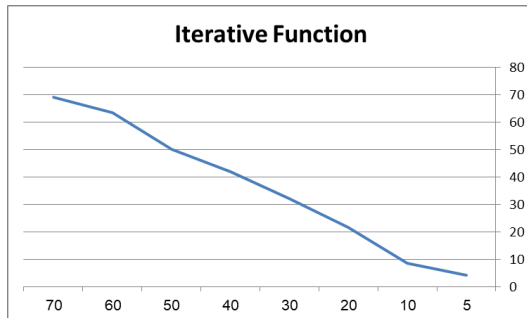




# Algorithm Assignments

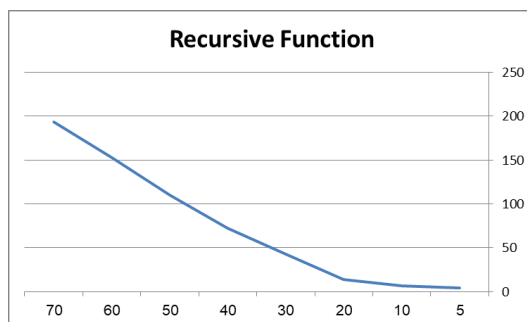
## Iterative Power Function:



Numbers	Time
x = 2 , n = 5	4.30326ms
x = 2 , n = 10	8.55908ms
x = 2 , n = 20	21.62148ms
x = 2 , n = 30	32.2397ms
x = 2 , n = 40	41.82186ms
x = 2 , n = 50	50.2353ms
x = 2 , n = 60	63.39854ms
x = 2 , n = 70	69.04682ms

We also notice that the program's running time increases when the inputs increase. This approach is typically more efficient than recursion, as it avoids the overhead of function calls and stack memory.

## Recursive Power Function:



Numbers	Time
x = 2 , n = 5	3.89898ms
x = 2 , n = 10	6.93894ms
x = 2 , n = 20	13.7714ms
x = 2 , n = 30	42.7762ms
x = 2 , n = 40	72.16ms
x = 2 , n = 50	109.967ms
x = 2 , n = 60	152.501ms
x = 2 , n = 70	193.72ms

A recursive power function is defined by breaking down the problem into smaller, similar subproblems until reaching a base case. this technique can suffer from stack overflow errors.

## Comparison

The two functions perform the required purpose, but when observing the run time for operation, we found that the first and second functions take approximately the same time when the inputs are small, but when the inputs are increased, the time for the recursive function increases significantly and noticeably more than the iterative function, because the recursive function takes up more space, which leads to making the computer take more time to process data. here compare the stack size when input  $2^{10}$  and notice that an iterative function takes 80 bytes but in the recursive function the memory increases until reaches 576 bytes . Therefore, the iterative function method is better than the recursive function.

```
PS C:\Users\BisanCo\Desktop\test>
Estimated stack size: 64 bytes
Estimated stack size: 128 bytes
Estimated stack size: 192 bytes
Estimated stack size: 256 bytes
Estimated stack size: 320 bytes
Estimated stack size: 384 bytes
Estimated stack size: 448 bytes
Estimated stack size: 512 bytes
Estimated stack size: 576 bytes
PS C:\Users\BisanCo\Desktop\test>
Estimated stack size: 80 bytes
```