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Homework 1

CSCI 3104
June 8, 2019

Problem 1

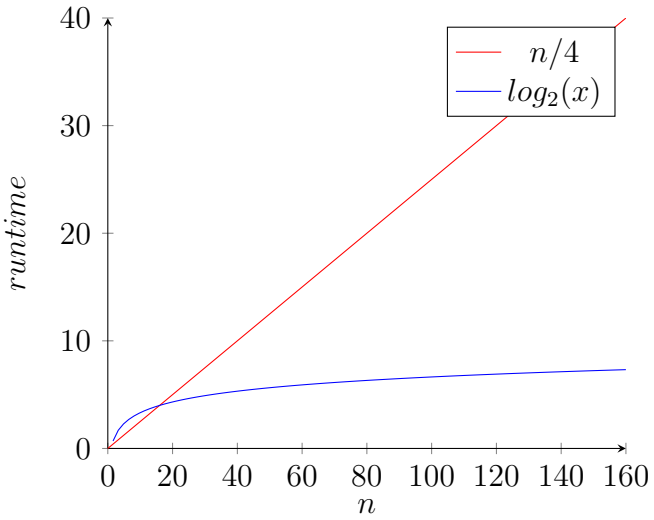
The Netflix recommendation system uses three main structures to curate a unique profile for each user. These are:

1. The User - and the direct data they provide (i.e., what is watched, when it is watched, how they have rated media, etc.)
2. Taggers - people paid to watch and tag all the media on Netflix with the media's unique identifiers
3. Machine Learning Algorithm - ties everything together

Netflix uses the user data to create communities of users who watch similar tags frequently. There are more than 2,000 unique communities currently and a single user can reside in multiple communities concurrently.

The machine learning algorithm at the heart of this process creates something similar to a weighted graph which places users with similar tag histories in clusters. forming the mentioned 'communities'. Media eliciting a positive response is shared with nearby located users. This is how the Netflix recommendation system works in a nutshell.

Problem 2



As the above illustration demonstrates, $n/4$ is the better algorithm for n < 16, while $log_2(x)$ is better suited for n ≥ 16.This is show by the $n/4$ line being lower than the $log_2(x)$ line on this interval, indicating a shorter runtime. At n $= 16$, the two equations are equivalent with $16/4 = log_2(16) = 4$, so from this point on the $log_2(n)$ equation would be preferred.

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Problem 3

Number of Drinks (d)	Number of Patrons (p)	Arnold's Equation	Barry's Equation
5	4	2.5	3.2189
10	10	5	4.6052
15	4	7.5	5.4161
20	8	10	5.9915

Arnold's $\|Error\|$	Barry's $\|Error\|$
1.5	.8
5	5.4
3.5	1.4
2	2.1

Arnold's Total $\|Error\|$	Barry's Total $\|Error\|$
12	9.7

I would argue that Barry's equation of *2ln(d)* is the more accurate for this small data set. I determined this by summing the absolute value of the error between each Arnold and Barry's equation inputs and the actual number of patrons. The total sum of $|error|$ was less for Barry and his algorithm, therein he had the more accurate algorithm (still not great though!).

Problem 4

1.
```
int Function (int n){
      int Sequence[n];
    if (n == 0){return 1;} else {Sequence[0] = 1;}
    if (n == 1){return -1;} else {Sequence[1] = -1;}
    if (n == 2){return 2;} else {Sequence[2] = 2;}
    for(int i = 3;  i < n ; i++){
      Sequence[i] = ((Sequence[i-1]*Sequence[i-2]) + Sequence[i-3]);
    }
    return Sequence[n-1];}
```

2. The 10th number in the sequence (with an index of 9) is -110,655. This as demonstrated by the following table:

n	G_n
0	1
1	-1
2	2
3	-1
4	-3
5	5
6	-16
7	-83
8	1333
9	-110,655
10	-147,503,281