CS 5050 Advanced Algorithms

Assignment 1: Shubham Swami – A02315672

Win Function:

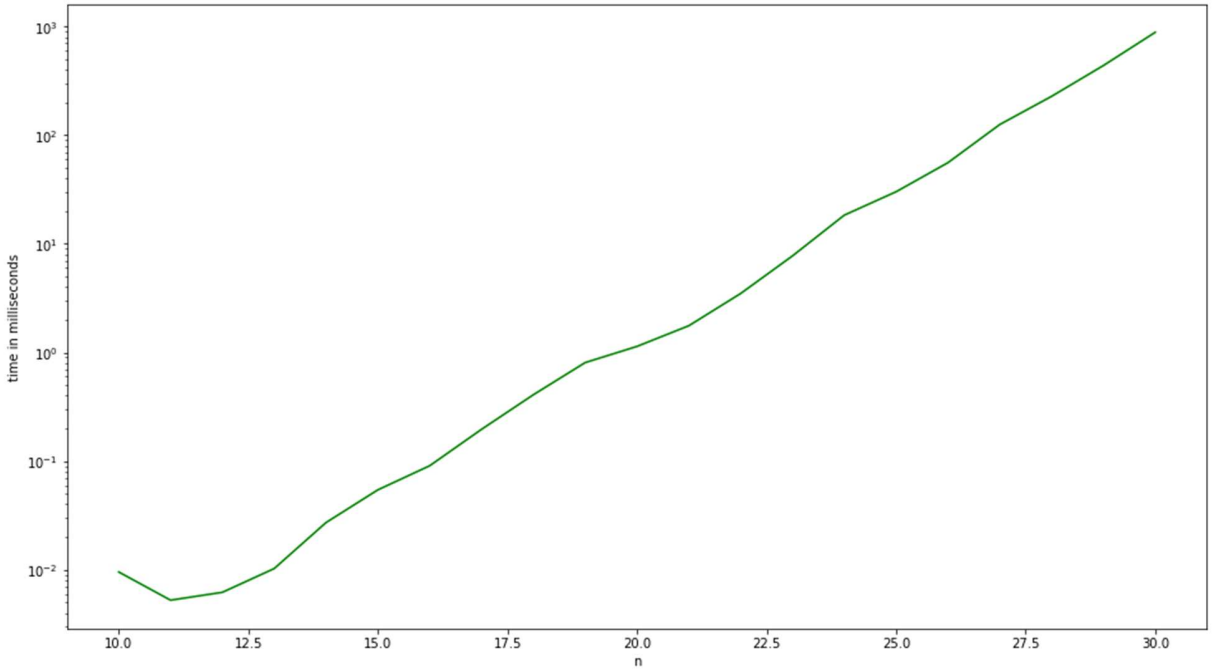
```
def win(n) -> bool:
        if n == 0:
            return False
        if n < 11:
            return True

        result = True

        for i in range(1,11):
            result &= win(n-i)
        return not result
```

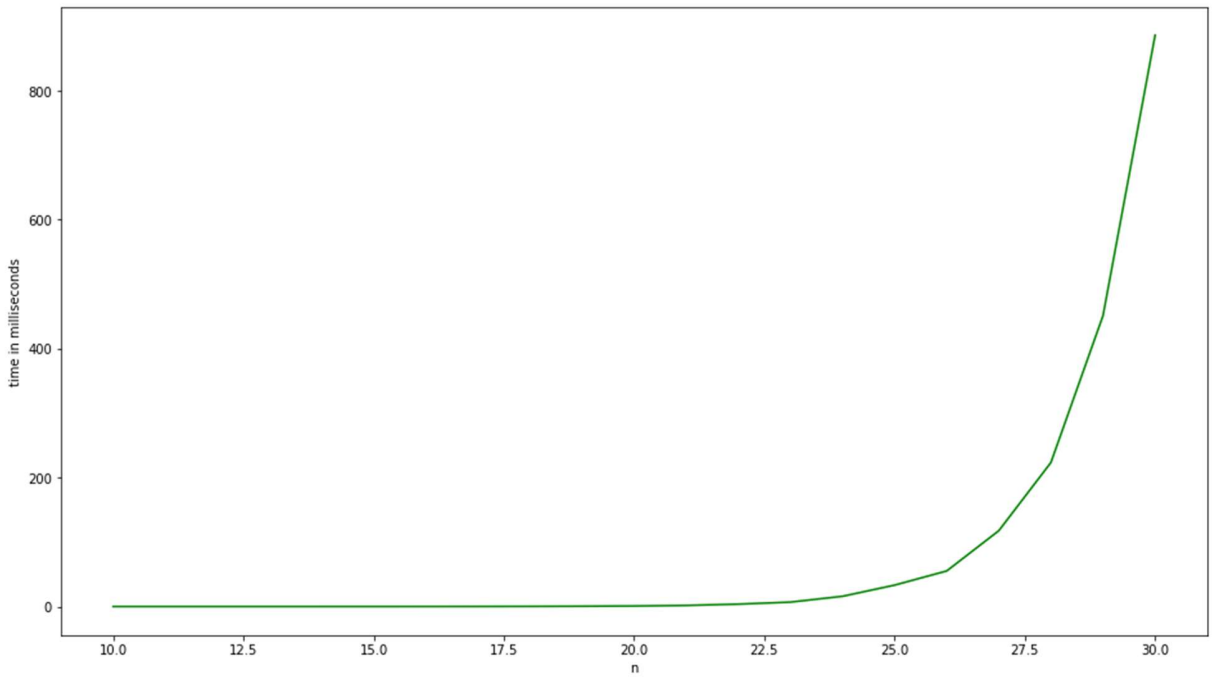
Graphs:

1. Y-scale = 'log'
   `time = 0.000002 1.922 ^ n`



2. Y-scale = ‘linear’

```
time = 0.000001 1.969 ^ n
```



New base of exponential function:

$2^{n/10} < f(n) < 2^n$

$\Rightarrow f(n) = ca^n$

$\Rightarrow \log(f(n)) = n \log a + \log c$

$\Rightarrow \log_2 a$ = slope (From graph 1)

$\Rightarrow \log_2 a = (y2-y1)/(x2-x1)$

$\Rightarrow \log_2 a = 0.83$

$\Rightarrow a = 2^{0.83}$

$\Rightarrow$ **a=1.777**

$\Rightarrow$ **f(n) = c*1.777^n**