

Assignment 1

1.) Input string: array size $n \geq 2$

Basic operation: compare $\text{word}[i] == \text{word}[n-i]$
from 0 to $n/2$

Output: "Palindrome" or "not Palindrome"

Best case: For $n=2$ basic operations 1/

For any n with extremes not equal
basic operations 1/

Worst case: It is a palindrome
operations $\frac{n}{2}$

1-15

$$f(n) = n^2 + 3n^3 \leftarrow \text{highest term } n^3$$
$$\Theta(n^3).$$

$$\Theta(f(n)) = O(f(n)) \cap \Omega(f(n))$$

$$\begin{aligned} 3n^3 + n^2 &\leq 4n^3 \\ 3n + 1 &\leq 4n \\ 1 &\leq n \end{aligned}$$

$$\begin{aligned} c &= 4 \\ N &= 1 \end{aligned} \quad O(n^3)$$

$$\begin{aligned} 3n^3 + n^2 &\geq 4n^3 \\ 1 &\geq n \end{aligned}$$

$$\begin{aligned} c &= 4 \\ N &= 1 \end{aligned} \quad \Omega(n^3)$$

1-16

$$6n^2 + 20n \leq cn^3$$

$$6n + 20 \leq cn^2$$

$$\text{for } N=2$$

$$24 + 20 \leq c4$$

$$44 \leq c4$$

$$N=2 \quad O n^3$$

$$c=4$$

$$\text{assuming } \Omega n^3$$

$$6n^2 + 20n \geq cn^3$$

$$6n^2 \neq n^3$$

$$\notin \Omega n^3$$

1-17

$$5n^5 + 4n^4 + 6n^3 + 2n^2 + n + 7 \in \Theta(n^5)$$

throwing low order terms

$$5n^5 \in \Theta(n^5)$$

since it is only exponential terms
lower terms can be thrown out

1-18

For any a_k a sufficiently large n

n^k will dominate so $p(n) \in \Theta(n^k)$

the largest exponent

1-22

$$\lg n < n < n \lg n < n^x < x^n < n!$$

| | | | | | |
|---------|---------|-----------|-------------|-----------------|------------|
| $\lg n$ | $8n+12$ | $n \ln n$ | $n^{5/2}$ | $5^{\lg n}$ | $n!$ |
| | | | $(\lg n)^2$ | c^n | $2^{n!}$ |
| | | | $5n^2+7n$ | 4^n | $(\lg n)!$ |
| | | | \sqrt{n} | $10^n + n^{20}$ | $\lg(n!)$ |
| | | | | n^n | |
| | | | | $n^n + \ln n$ | |