CSE 12 – Basic Data Structures and Object-Oriented Design
Lecture 10

Greg Miranda & Paul Cao,Winter 2021

This lecture is being recorded

Announcements

- Quiz 10 due Monday @ 8am
- Survey 4 due Friday @ 11:59pm
- PA3 due tonight @ 11:59pm
- Exam 1 on Friday (no class)
  - Released @ 8am on Friday
  - Closes @ 10am on Saturday
  - More details on Piazza

26 hours

↳ 60 minutes
↳ no makeups

Lectures 1-8

Topics

- Questions on Lecture 10?
- Big O

Questions on Lecture 10?

Let f(n) = 100

Big O $f(n) \leq C * g(n)$

- Which of the following is NOT a correct bound?

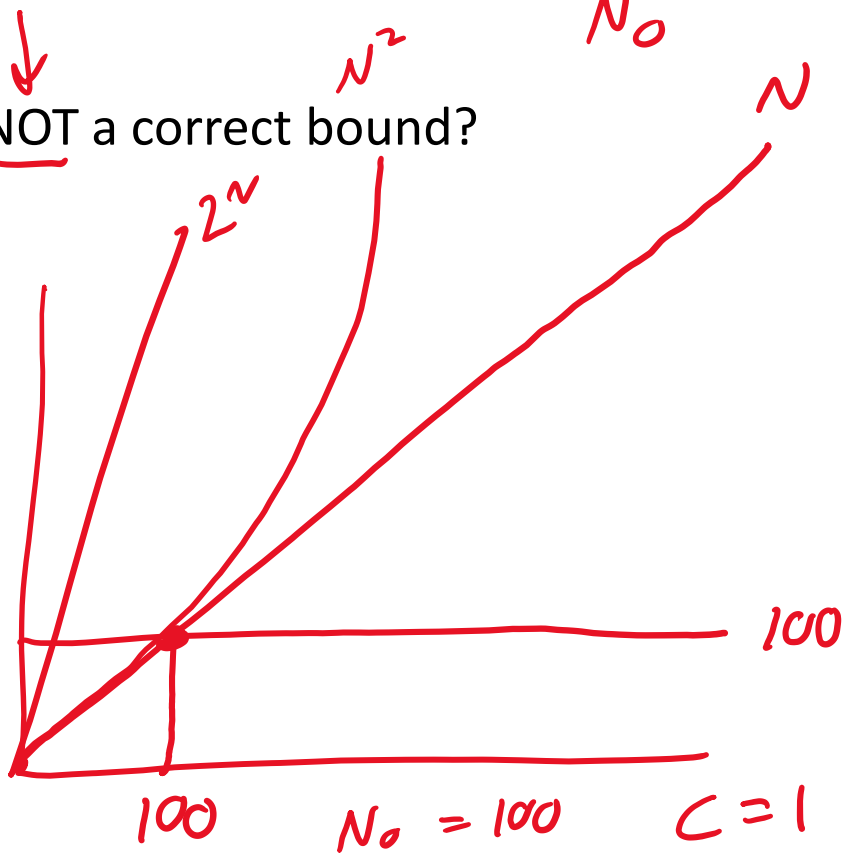
5 A. f(n) is $O(2^n)$

0 B. f(n) is $O(n^2)$

2 C. f(n) is $O(n)$ ←

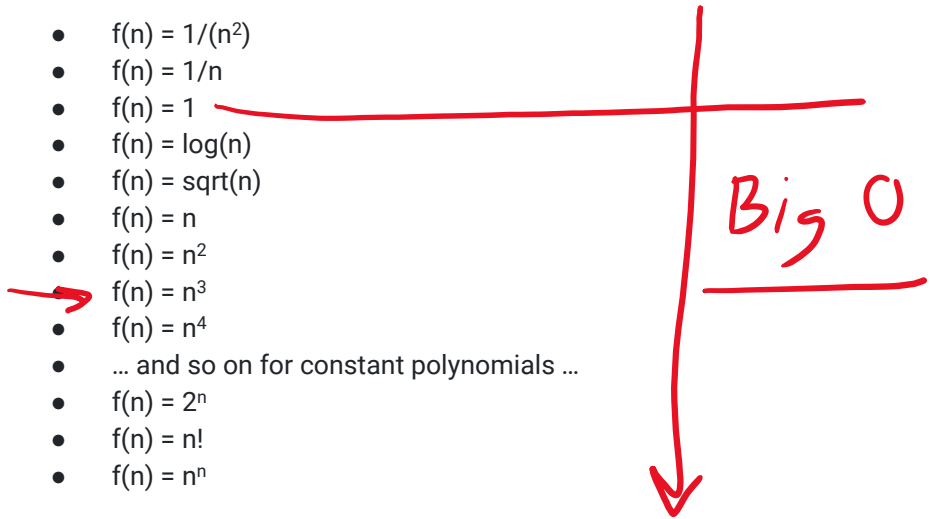
5 D. f(n) is $O(n^{100})$

51 E. None of these



For each function in the list below, it is related to the function below it by O, and the reverse is **not** true. That is, *n is O(n^2)* but *n^2 is **not** O(n)*.

- f(n) = $1/(n^2)$
- f(n) = 1/n
- f(n) = 1
- f(n) = log(n)
- f(n) = sqrt(n)
- f(n) = n
- f(n) = n^2
- f(n) = n^3
- f(n) = n^4
- … and so on for constant polynomials …
- f(n) = 2^n
- f(n) = n!
- f(n) = n^n



Let f(n) = 3n3 + 2n + 7

N^3

$3N^3 + 2N^3 + 7N^3$

$\leq 5(N) \rightarrow 12N^3$

- Which of the following is a correct bound?

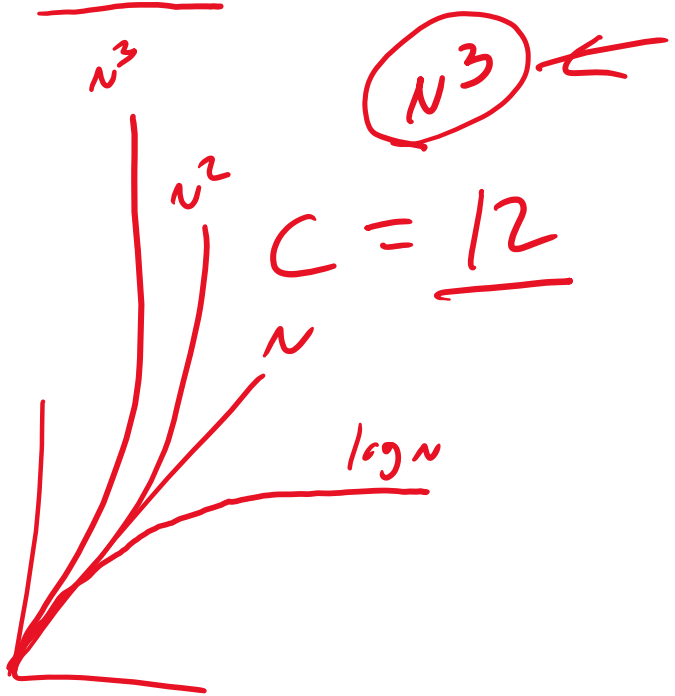
1 ~~A. f(n) is O(log(n))~~

0 B. f(n) is $O(n^2)$

2 C. f(n) is O(n)

56 D. f(n) is $O(n^3)$

6 E. None of these



```
void printAllElementOfArray(int[] arr) {
    for (int i = 0; i < arr.legnth; i++) {
        printf("%d\n", arr[i]);
    }
}
```

$1 + (N+1) + N + N$

$f(N) \rightarrow 3N + 2$

- Which of the following is a correct bound?

0 A. f(n) is O(log(n)) ✗

3 B. f(n) is $O(n^2)$ ✓

21 C. f(n) is O(n) ✓

0 D. f(n) is $O(n^3)$ ✓

39 E. More than one of these

$3N + 2N = 5N$

$f(N) \leq C * g(N)$, $g(N) = N$

$C = 5$

$N_0 = 6$

```
void printAllPossibleOrderedPairs(int arr[]) {
    for (int i = 0; i < arr.length; i++) {
        for (int j = 0; j < arr.length; j++) {
            printf("%d = %d\n", arr[i], arr[j]);
        }
    }
}
```

$1 + (N+1) + N +$

$N(1 + (N+1) + N + N)$

$2N + 2 + N(3N+2)$

$3N^2 + 2N + 2N + 2$

$f(n)$ $3N^2 + 4N + 2$

- Which of the following is a correct bound?

A. f(n) is O(log(n)) ✗

B. f(n) is O(n^2) ✓

C. f(n) is O(n) ✗

D. f(n) is O(n^3) ✓

E. More than one of these

```
int fibonacci(int num) {
    if (num <= 1) return num;
    return fibonacci(num - 2) + fibonacci(num - 1);
}
```

fibonacci (5)

17 times

- Which of the following is a correct bound?

$2^5 \Rightarrow 32$

A. f(n) is $O(2^n)$

B. f(n) is $O(n^2)$

C. f(n) is $O(n)$

D. f(n) is $O(n^3)$

E. More than one of these