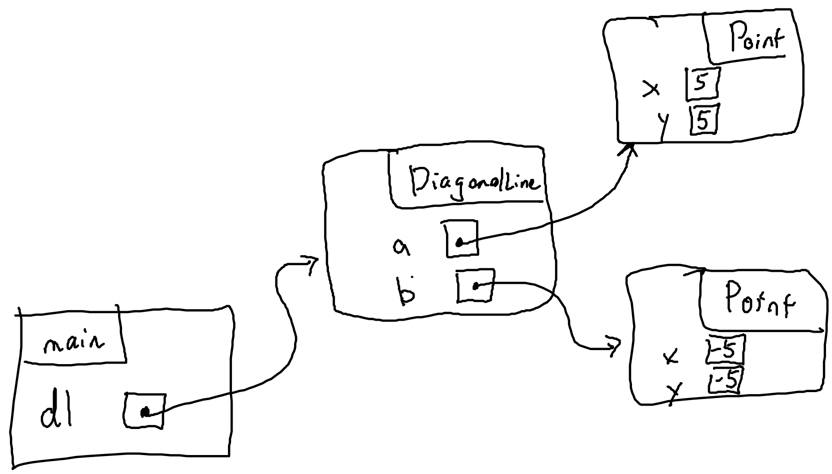

main
dl
DiagonalLine
a
b
Point
x
5
y
5
Point
x
-5
y
-5

Transitivity:

if $x \le y$ and $y \le z$ then $x \le z$

$$(n-1)+(n-2)+(n-3)+\cdots+1+0$$

$$\sum_{i=1}^{n-1} i = \frac{n(n-1)}{2}$$

$$= \frac{n^2}{2} - \frac{n}{2}$$

isSorted 1

$$n-1$$

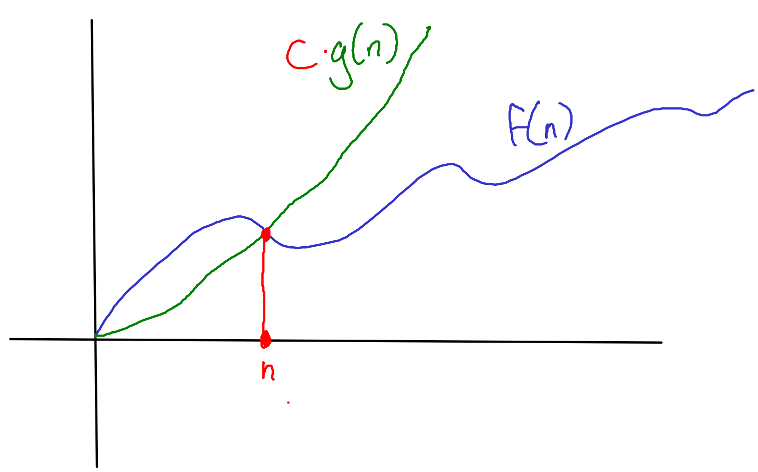
isSorted 2

$$100(n-1)$$

isSorted 2 bad

$$= 100n - 100$$

"$f(n)$ is $O(g(n))$" is $\underbrace{\exists}_{\text{exists}}\, c>0,\ k.$ s.t. $\underbrace{\forall}_{\text{for all}}\, n \ge k.\ f(n) \le c\,g(n)$



"$f(n)$ is $O(g(n))$" is $\underbrace{\exists}_{\text{exists}} c>0, k.$ s.t. $\underbrace{\forall}_{\text{for all}} n \ge k.\ f(n) \le c\,g(n)$

$$2n^2 \text{ is } O(n^2)$$

$$\exists c>0, k.\ \forall n \ge k.\ 2n^2 \le cn^2$$

Let $c=2, k=0$. $\quad \forall n \ge 0.\ 2n^2 \le 2n^2.$

"$f(n)$ is $O(g(n))$" is $\underbrace{\exists}_{\text{exists}} c>0, k.$ s.t. $\underbrace{\forall}_{\text{for all}} n \ge k.\ f(n) \le c\,g(n)$

$$2n^2 - 5n + 17 \text{ is } O(n^2).$$

$$\exists c>0, k.\ \forall n \ge k.\ 2n^2 - 5n + 17 \le cn^2$$

$c=2 \quad k=17/5$

$$\forall n \ge \tfrac{17}{5}.\ \cancel{2n^2} - 5n + 17 \le \cancel{2n^2}$$

$$\forall n \ge \tfrac{17}{5}.\ -5n + 17 \le 0$$

$$\forall n \ge \tfrac{17}{5}.\ 17 \le 5n$$

$$\forall n \ge \tfrac{17}{5}.\ \tfrac{17}{5} \le n$$

"$f(n)$ is $O(g(n))$" is $\underbrace{\exists}_{\text{exists}} c>0, k.$ s.t. $\underbrace{\forall}_{\text{for all}} n \geq k.\ f(n) \leq c\,g(n)$

False statement:

$$n^2 \text{ is } O(n).$$

$$\exists c>0, k.\ n \geq k.\ n^2 \leq cn$$