$O(n^2)$

size $= n$

```
Function is_sorted(array)
    for each i in 0..size(array)-1:
        for each j in i+1 ... size(array)-1:
            if array[i] > array[j]
                return false
            end if
        end for
    end for
    return true
End Function
```

n times

n times

n-1 times

1

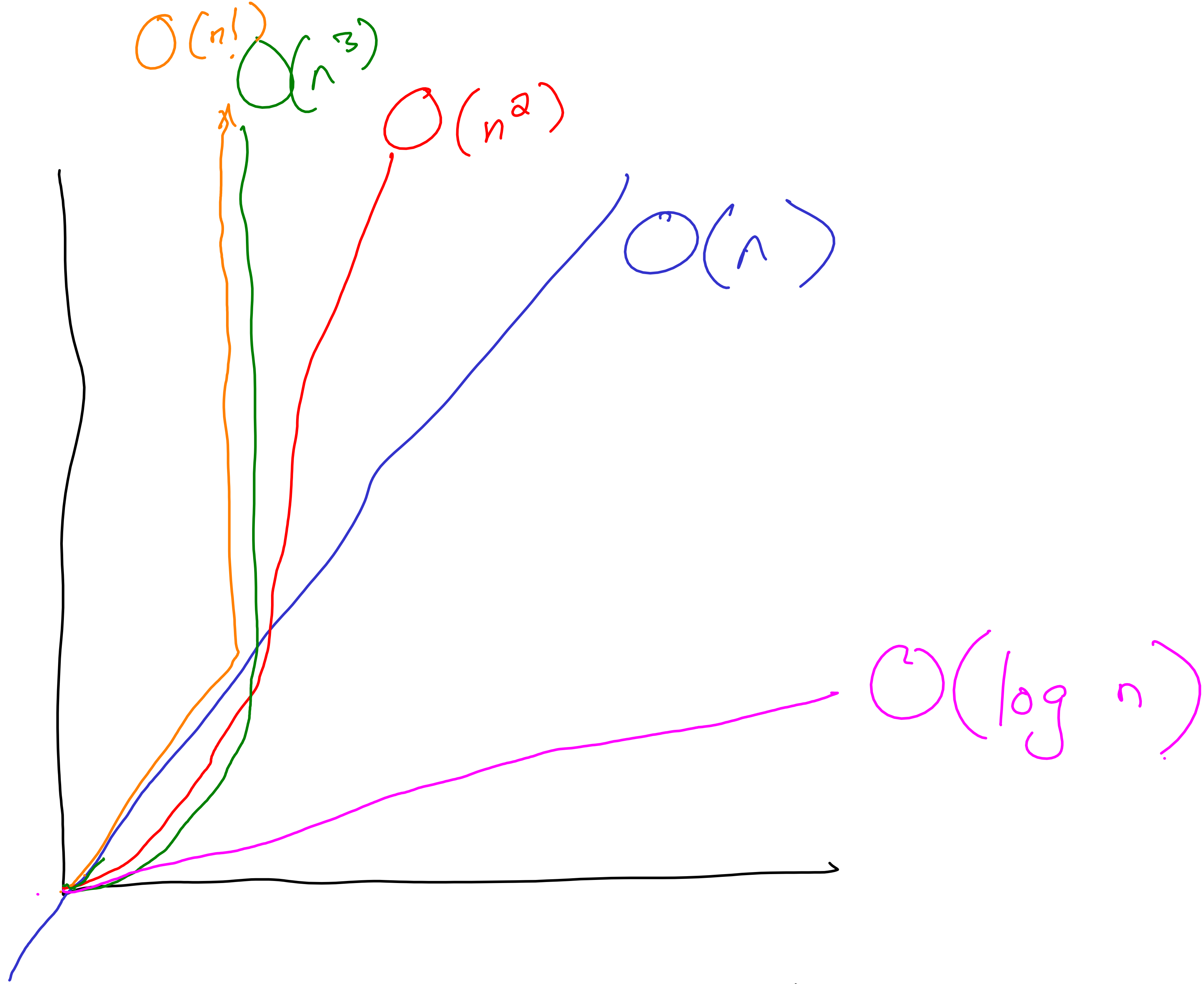
1

1

$(n + n-1 + n-2 \dots + 1)$

$n(n-1)$

$(n^2 - n + 1)/2$

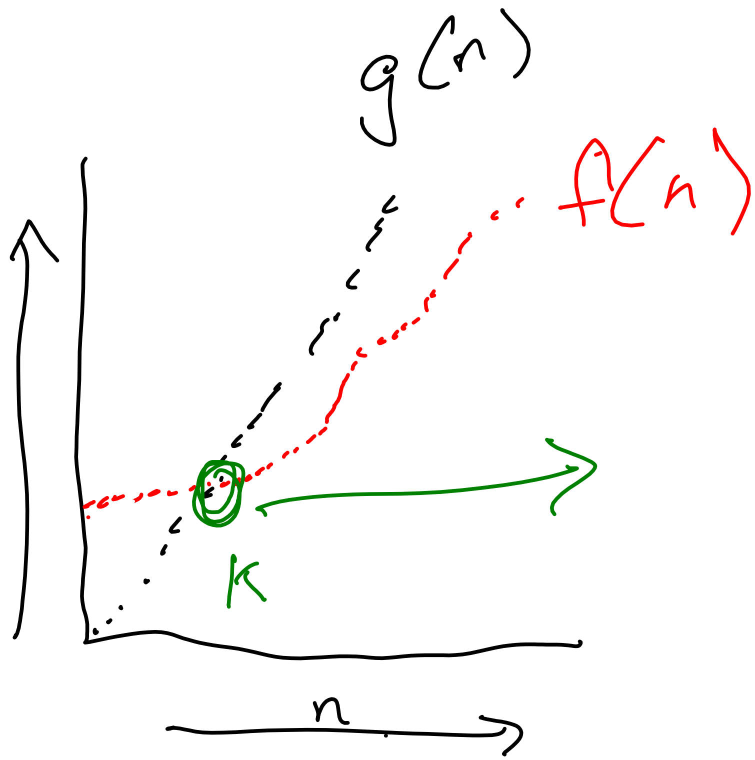


O(n!)
O(n^3)
O(n^2)
O(n)
O(log n)

$f(n)$ is $O(g(n))$

iff

$\exists c > 0, k \geq 1. \forall n \geq k. \quad f(n) \leq c g(n)$



Let $f(n) = n^2$. Then $f(n)$ is $O(n^3)$.

$\exists c > 0, k \geq 1. \forall n \geq k. \quad n^2 \leq c n^3$

Let $c = 1$, $k = 1$. Then it suffices to show

$\forall n \geq 1. \; n^2 \leq n^3$

$\forall n \geq 1. \; 1 \leq n$

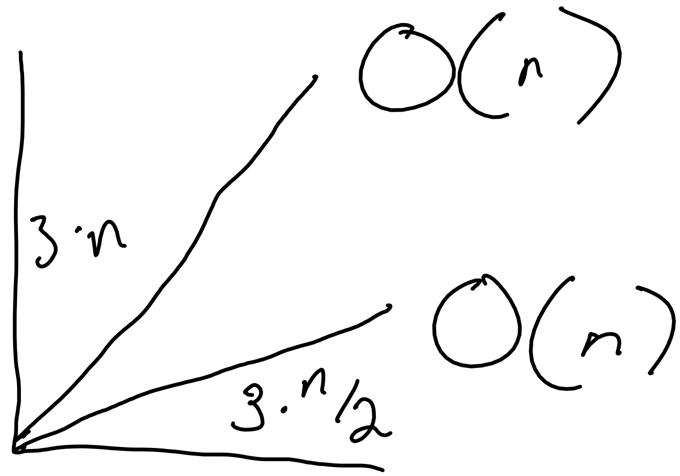
Let $f(n) = n^2$. Then $f(n)$ is $O(n^3)$.

$\forall n \geq 1. \; 1 \leq n$

$\forall n \geq 1. \; n^2 \leq n^3$

$\exists k \geq 1. \quad \forall n \geq k. \; n^2 \leq n^3 \cdot 1$

$\exists c > 0, k \geq 1. \; \forall n \geq k. \; n^2 \leq c n^3$



Let $f(n) = 3n$. Then $f(n)$ is $O(n)$.

$\exists c > 0, k \geq 1.\ \forall n \geq k.\ 3n \leq cn$

Let $c = 3$, $k = 1$. It sts

$\boxed{\forall n \geq 1.}\ 3n \leq 3n$

Let $f(n) = 2n^2 + n$. Then $f(n)$ is $O(n^2)$.

$\exists c > 0, k \geq 1. \forall n \geq k. 2n^2 + n \leq cn^2$

$c = 3 \quad k = 1 \qquad \forall n \geq 1. 2n^2 + \underline{n} \leq 3n^2$.

$\forall n \geq 1. n^2 \geq n \qquad \left[\begin{array}{l} \forall n \geq 1. \ 2n^2 \leq 2n^2 \\ \forall n \geq 1. \ n \leq n^2 \end{array} \right]$

$$\begin{array}{l} a \leq c \\ b \leq d \end{array} \implies a + b \leq c + d$$