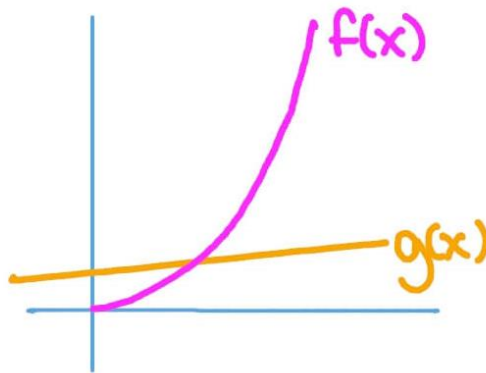


Growth Rate

- ### Big-O Complexity
-
- The graph illustrates the growth of various Big-O time complexities. The Y-axis represents the number of operations, and the X-axis represents the number of elements. The complexities shown are:
- $O(1)$ (Red line): Constant time complexity, showing a flat line at 1 operation.
 - $O(\log n)$ (Dark Blue line): Logarithmic time complexity, showing a very slow increase.
 - $O(n)$ (Green line): Linear time complexity, showing a steady increase.
 - $O(n \log n)$ (Purple line): Linearithmic time complexity, showing a faster increase than linear.
 - $O(n^2)$ (Teal line): Quadratic time complexity, showing a significant increase.
 - $O(2^n)$ (Orange line): Exponential time complexity, showing a very rapid increase.
 - $O(n!)$ (Light Blue line): Factorial time complexity, showing the most rapid increase.

Growth Rate Function Comparison

After some point $f(n)$ is greater than $g(n)$. After that point it's guaranteed that $f(n)$ is bigger than $g(n)$ but before that point we cannot guarantee that $f(n)$ is bigger than $g(n)$.



That means that $f(n)$ is asymptotically bigger than $g(n)$.

Problems

1. Assume that $f(n) = 5n + 50$ and $g(n) = n$. Is $f(n) = O(g(n))$
2. Find the upper bound for $f(n) = 3n + 8$
3. Find the upper bound for $f(n) = n^2 + 10$
4. Find the lower bound for $f(n) = 10n^2 + 5$
5. Show that $f(n) = n^3 + 3n^2 = \theta(n^3)$