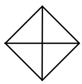


Why

We are regularly referring to a few common growth classes.

Definitions

Let $c \in \mathbf{R}$. Then we name the following growth classes

growth class	name
$O(1)$	*constant growth class*
$O(\log(x))$	*logarithmic growth class*
$O(\log(x)^c)$	*polylogarithmic growth class*
$O(x)$	*linear growth class*
$O(x^2)$	*quadratic growth class*
$O(x^c)$	*polynomial growth class*
$O(c^x)$	*exponential growth class*

We have written these in order:

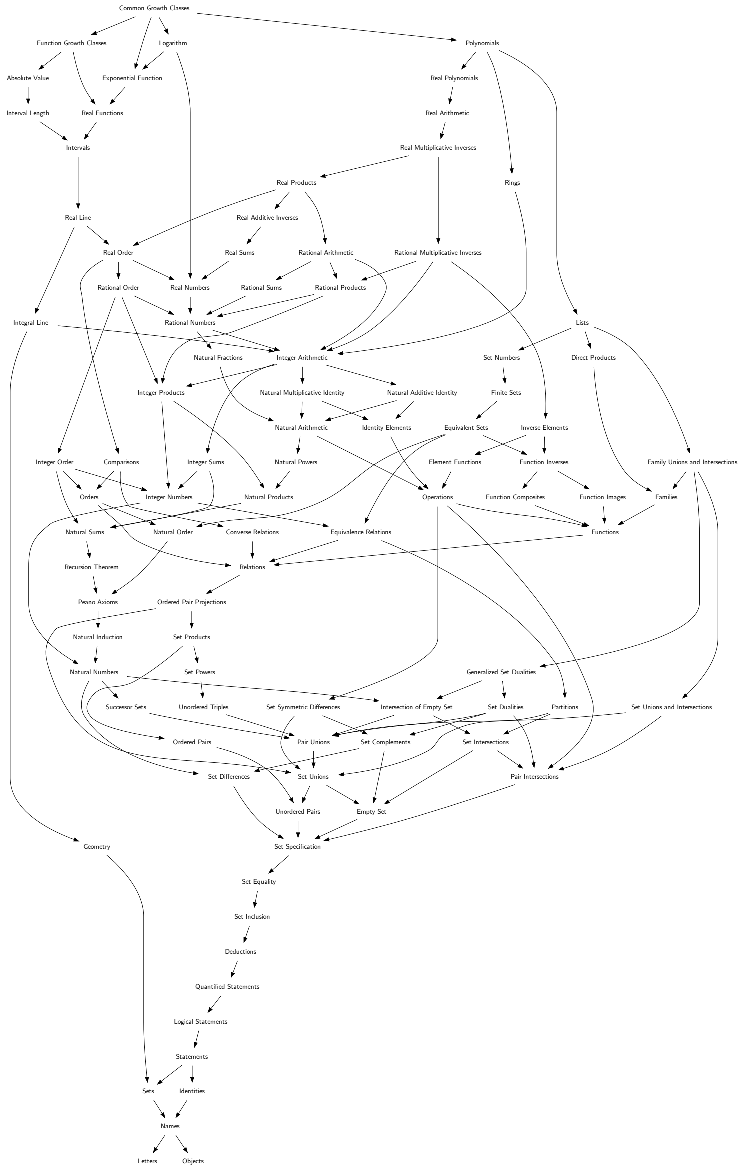
$$O(1) \subset O(\log(x)) \subset O((\log(x))^c) \subset \cdots \subset O(x^c) \subset O(c^x).$$

A function that grows faster (is in the upper growth class) of a power of x is called *superpolynomial*. One that grows slower than c^n for some $c \in \mathbf{R}$ is called *subexponential*. The class $O(\log(x^c))) = O(\log(x))$ since $\log(x^c) = c \log x$. Similarly, for all $c_1, c_2 > 0$, $O(\log_{c_1}(x)) = O(\log_{c_2}(x))$.

This list is useful because of the following

Proposition 1. *Let $f, g : \mathbf{R} \to \mathbf{R}$ and defined $h : \mathbf{R} \to \mathbf{R}$ by $h = f + g$. If $O(f) \subset O(g)$, then $h \in O(g)$.*

In other words, if a function h is the sum of f and g and g is growing faster, then g (the one growing faster) determines the order of h.


Common Growth Classes
Function Growth Classes
Logarithm
Polynomials
Absolute Value
Exponential Function
Real Polynomials
Interval Length
Real Functions
Real Arithmetic
Intervals
Real Multiplicative Inverses
Real Products
Rings
Real Line
Real Additive Inverses
Real Order
Real Sums
Rational Arithmetic
Rational Multiplicative Inverses
Rational Order
Real Numbers
Rational Sums
Rational Products
Integral Line
Rational Numbers
Lists
Natural Fractions
Integer Arithmetic
Set Numbers
Direct Products
Integer Products
Natural Multiplicative Identity
Natural Additive Identity
Finite Sets
Natural Arithmetic
Identity Elements
Equivalent Sets
Inverse Elements
Integer Order
Comparisons
Integer Sums
Natural Powers
Element Functions
Function Inverses
Family Unions and Intersections
Orders
Integer Numbers
Natural Products
Operations
Function Composites
Function Images
Families
Natural Sums
Natural Order
Converse Relations
Equivalence Relations
Functions
Recursion Theorem
Relations
Peano Axioms
Ordered Pair Projections
Natural Induction
Set Products
Natural Numbers
Set Powers
Generalized Set Dualities
Successor Sets
Unordered Triples
Set Symmetric Differences
Intersection of Empty Set
Set Dualities
Partitions
Set Unions and Intersections
Ordered Pairs
Pair Unions
Set Complements
Set Intersections
Set Differences
Set Unions
Pair Intersections
Unordered Pairs
Empty Set
Geometry
Set Specification
Set Equality
Set Inclusion
Deductions
Quantified Statements
Logical Statements
Statements
Sets
Identities
Names
Letters
Objects