Precalculus

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Preface

The goal of this notes, is to have a formal reference of the important subjects necessary to understand calculus and more advanced subjects.

Mathematics possesses not only truth, but supreme beauty, a beauty cold and austere, like that of a sculpture, and capable of stern perfection, such as only great art can show.
–Bertrand Russell

Contents

1 Foundations

1.1 Greek Alphabet

Letter	*Lower*	*Upper*	*Letter*	*Lower*	*Upper*
alpha	α	A	*nu*	ν	N
beta	β	B	*xi*	ξ	Ξ
gamma	γ	Γ	*omicron*	o	O
delta	δ	Δ	*pi*	π	Π
epsilon	ϵ	E	*rho*	ρ	P
zeta	ζ	Z	*sigma*	σ	Σ
eta	η	H	*tau*	τ	T
theta	θ	Θ	*upsilon*	υ	Υ
iota	ι	I	*phi*	ϕ	Φ
kappa	κ	K	*chi*	χ	X
lambda	λ	Λ	*psi*	ψ	Ψ
mu	μ	Mu	*omega*	ω	Ω

1.2 Language of mathematics

The language of mathematics is a system to describe concrete ideas.

1.3 Sets

A set is a collection of distinct objects.

1.3.1 Special Sets

There are some sets that hold a great mathematical importance and are used regularly everywhere so they have acquire their own names and their conventions.
The empty set is one example, is usually denoted by $\emptyset$ or . Different families of numbers have their own names as well like:

- Prime Numbers - $\mathbb{P}$ or **P** = {2, 3, 5, 7, 11, 13, 17, 19, 23, ...}
- Natural Numbers - $\mathbb{N}$ or **N** = {1, 2, 3, 4, ...} sometimes 0 is considered as well
- Integers - $\mathbb{Z}$ or **Z** = {..., -2, -1, 0, 1, 2, ...}
- Real - $\mathbb{R}$ or **R** = Every number that can be found on the number line
- Complex Numbers - $\mathbb{C}$ or **C** = Every number that can be expressed in the form $a + bi$
- Irrational Numbers - $\mathbb{I}$ or **I** = any real number that cannot be expressed as a/b where a,b are integers
- Rational Numbers - $\mathbb{Q}$ or **Q** = any number that can be expressed as a/b where a,b are integers

1.3.2 Operations

There are several operations for construction new sets.

Unions

The union of **A** and **B** is denoted by $\mathbf{A} \cup \mathbf{B}$, can be also seen as the set of elements that belong to **A** or **B**.

Intersections

The intersection of **A** and **B** is denoted by $\mathbf{A} \cap \mathbf{B}$, can be also seen as the set of elements that belong to **A** and **B**. If **A** and **B** don't have any elements in common their intersection is the $\emptyset$ and they are said to be disjoint.

Complements

A set complement is everything else that does not belong in it. $\mathbf{A} \cap \mathbf{A} = \Omega$

2 Functions

3
Inequalities

4
Geometry

5

Sequences and Series

6
Conics

7
Trigonometry