

Chapter 1. Precalculus review

1.1 What is Calculus?

Read independently

1.2 Review of Elementary mathematics

Sets

Notation

$a \in A$	$A \ni a$	a belongs to set A
$a \notin A$	$A \not\ni a$	a does not belong to set A
$A \subset B, A \subseteq B$	$B \supset A, B \supseteq A$	Set A is contained in the set B (or equal)
$A \subsetneq B$	$B \supsetneq A$	A is contained in B but not equal
\cup	\bigcup	union of sets
\cap	\bigcap	intersection of sets
\emptyset		empty set
\implies		implies then
\impliedby		follows from because if
\iff		iff if and only if
\forall		forall
\exists		exists
$\exists!$		uniquely exists
$\&$	\wedge	logical AND
\vee		logical OR

Real Numbers

Classification $\mathbb{N} \mathbb{Z} \mathbb{Q} \mathbb{R} (\mathbb{C} \text{ who knows})$

Decimal Representation Note that decimal representation has small non-uniqueness:
 $0.9999\dots = 1.000\dots$

Rational numbers and only end by a period like $2376.5 \underbrace{873}_{873} \underbrace{8739}_{8739} \underbrace{8739}_{8739} \dots$

Geometric representation Real line

Order $<, >, \leq, \geq$

read from textbook

Density All real numbers could be approximated by rationals

Some rationals produce superficially small error (given their small denominators): $\frac{22}{7}$ is very good approximation to π (better than 3.14).

Absolute value Check this definition: $|x| = \sqrt{x^2}$ ($\sqrt{\cdot}$ means non-negative square root).
Is it correct?

Intervals what are $(-1, -2)$, $(4, 4)$, $[-3, -3)$, $(1, 1]$, $[7, 7]$?
Find $[1, 4] \cap (2, 6]$, $(-\infty, 3) \cap [7, \infty)$, $(-6, 0) \cup (-4, 6]$

Boundedness Bounded above, upper bound, bounded below, lower bound

Factorials $n!$ (! is a factorial rather than exclamation)

1.2.1 Algebra

Decompose $x^6 - y^6$ as a product

Basic factoring

Quadratic Eqs

1.2.2 Geometry

Do you know how to calculate area, perimeter of the following planar figures?

- Triangle, Isosceles Triangle, Equilateral Triangle
- Rectangle, Square,
- Circumference, Disk (circle could mean both)

What else do you know about triangles? quadrilaterals?

Do you know how to calculate volume, surface area of the following solids?

- Rectangular Solid (rec. parallelepiped box)
- Cube
- Sphere, Ball
- Cylinder
- Cone

1.3 Review of Inequalities

Not much theory, but skills required (repeat Friday):

quadratic ineqs

inequalities involving absolute value

Triangle inequality:

$|a + b| \leq |a| + |b|$; = iff a and b are not of opposite signs.