Part I
Symbols typically used in maths

Several symbols can appear without previous notice. They will always be defined (except the most usual ones: $\mathbb{R}$, $\mathbb{N}$, etc.), but in any case the apparition of a new (for you) symbol shouldn't trouble you as the symbol doesn't have any meaning in itself (only with a definition), although most symbol have typical uses. For example, a real number that is not small shouldn't be called ϵ.

Greek letters are the most common non-latin alphabet symbols used. The upper case are not used when their form is the same as Latin ones. You can find the list of those symbols in Table 1.

Some other symbols are used in other contexts, for example $\aleph$ for cadinality, $\beth$ and $\gimel$ for some specific functions, but these uses are in minority.

More frequently, a change in font of latin letters is used. For example: $\mathbb{Z}, \mathbb{Q}, \mathbb{N}$ for sets of numbers, $\mathcal{L}$ for the likelihood, $\mathfrak{S}$ for a set of permutations, ℓ to differentiate from l, etc.

I might have to use other symbols such as coptic alphabet or obsolete greek letters, but as mathematicians you should know that these symbols do not have meaning by themselves, you just have to reproduce them with your pencils.

Character	name	typical use
β	beta	parameter, Real number, Beta distribution
γ	gamma	parameter
Γ	upper case gamma	Γ function
δ	delta	parameter, difference, indicator function, dirac function, distance function
Δ	upper case delta	Discriminant, difference operation, Operator, distance matrix
ϵ	epsilon	small parameter, usually $\to 0$
ζ	zeta	function, parameter
η	eta	small parameter, parameter, function
θ, ϑ	theta	parameter
Θ	upper case theta	Set of parameters
ι	iota	index
κ	kappa	index, parameter
λ	lambda	parameter, (wave) length
Λ	upper case lamda	matrix, space of functions
μ	mu	parameter, mean
ν	nu	parameter, other mean, frequency
ξ	xi	parameter
Ξ	xi	matrix, set of parameters
o	omicron	not used
π, ϖ	pi	archimedian constant, probability, function
Π	upper case pi	probability
ρ	rho	kernel, distance, constant
σ	sigma	standard deviation
Σ	upper case Sigma	covariance matrix
τ	tau	parameter, time
υ	upsilon	real number
Υ	upper case upsilon	space of functions
ϕ, φ	phi	function, parameter
Φ	upper case phi	function
χ	chi	χ^2 function
ψ	psi	function
Ψ	upper case psi	function, Psi corp
ω	omega	real number, element of Ω
Ω	upper case Omega	space of possibles.

Table 1: My first Greek alphabet