The nChairX package

ChairX

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Abstract

This is a part of the new nChairX package providing the famous ChairX style.

Contents

1 Introduction

This package defines the New ChairX style. Based on previous versions we provide a major clean-up with many additional features and easier handling. The style file is a rather high-level style file providing many standard environments needed in math, many macros needed in differential geometry, algebra, and analysis and some other useful tools. The style file includes several other packages and sets various defaults. There is a companion package called `chairxmath` which only defines the math-related macros but avoids setting environments etc.

2 Usage

To use the package you have to include it as usual by

```
\usepackage{nchairx}
```

and specify some options if needed.

2.1 Package Options

`noMath` The math macros of the `nchairx` package can be excluded with the option `noMath`. This can be used if one does not need the math macros of `nchairx` and there occur clashes with other packages or macros, but the environments and other settings of `nchairx` are still desired.

2.2 Setting the Defaults

Being a rather high level package, several over-all styling options are set to new defaults. This includes several spacings, numbering schemes etc. Currently, the most important changes are the following:

- We redefine `\mathbb` to use the fonts from the `bbm` package, looks so much nicer: $\mathbb{R}$ and $\mathbb{C}$ but also $\mathbb{k}$.
- We redefine `\mathcal` to use the font `EulerScript` from the `euler` package yielding $\mathcal{CLO}$ and we define `\mathsrc` to use the script font `rsfso` from the `rfsfo` package giving $\mathscr{ABCD}$. Please make sure that these fonts are installed properly: with a recent LaTeX-installation this should be automatic.

- Equation numbers are always with sections in front. In the `book` class this leads to equation numbers having the chapter number and the section number in front.
- Displayed formulas are allowed to break over pages. As in mathematical texts one has many (many!) long formulas this is really necessary. Without allowing this by default a case by case decision typically leads to sub-optimal results in page breaks.
- We set `\arraystretch` to the value `1.2` to have a bit more space in arrays.
- The `\left` and the `\right` commands in math mode have a notoriously bad spacing. This is fixed by a hack from TexExchange.
- The command `\cleardoublepage` will produce empty headers on an empty left page. This will only affect the behaviour in classes with left/right pages like the book class. It generally looks weird to have an empty left page containing just the page number or some default header but nothing else.

2.3 Supporting many Languages

For the use of other languages than English (our default) the options of the `babel` package are respected. The important keywords of nChairX (essentially the names of the environments) will then be translated accordingly. In order to enable this you have to load `babel` with the additional language you intend to use, e.g.

```
\usepackage[german,strings]{babel}
```

before you load `nchairx`. Currently, only German is supported beside English. Then you can switch between the languages inside one document with `\selectlanguage{language}` to get the correct names of the keywords. When loading several languages it is always a good idea to place an explicit `\selectlanguage{language}` at the beginning of the document to set the stage correctly. Note that you have to use the `strings` option for babel as well.

2.4 Environments

The nChairX package provides many predefined mathematical environments like definitions, theorems etc. The styling is fairly standard. The names of the environments are language sensitive based on the `babel` package.

2.4.1 The Predefined Environments

The following theorem-like environments will be defined as standards as they will be needed anyway. We use the `ntheorem` package to do this and load it automatically with several options. Hence you should not load it by hand with other options.

As usually needed we define the standard mathematical environments `claim`,

`claim`
`corollary`
`definition`
`lemma`
`proposition`
`theorem`

corollary, definition, lemma, proposition, and theorem with a common appearance: titles in bold, body in italic. The numbering will use a common counter including the section counter.

conjecture
convention
example
notation
question
remark
exercise
maintheorem
nn<environment>

The environments conjecture, example, notation, question, and remark use the same counter as the above ones but have a body in roman.

The environment exercise has its own counter including the section and is set in roman.

We have a maintheorem environment which has no numbering at all: this is useful for papers where there is one and only one main theorem you want to place at a particular place, say in the introduction.

For all these environments there is a non-numbered version nn<environment>. So one can use e.g. \begin{nntheorem} ... \end{nntheorem} to get the theorem environment as above, but without numbering.

These environments are compatible with autoref. Hence using

```
\autoref{label_to_<env-name>}
```

will give a linked reference to the environment labelled with

```
\label{label_to_<env-name>}
```

with a prefix depending on the type of environment. This also works for chapters, sections, etc. For non-numbered environments one should still use \ref.

proof
subproof

We have a proof and a subproof environment with an automatic tombstone sign at their ends. The location of the tombstone signs is maintained by the ntheorem package in a really good way. The proof environment finishes with a box sign, the subproof with ▽. The only catch is that one should not use the commands \[and \] for equations without numbers in the proof environment anymore: this causes errors as soon as one wants to place a \tag{$*$} for these equations. Instead, one can achieve this as follows:

```
\begin{equation*}
    E = mc^2
    \tag{$*$}
\end{equation*}
```

It seems that also some float environments (like figure or table) at the end of the proof confuse the ntheorem package: you should avoid this by placing the float outside of the proof environment.

hint

We have a hint environment to be used inside exercises: set in a very small font and without numbering.

<environment>list

We have special list environments claimlist, conjecturelist, conventionlist, corollarylist, definitionlist, examplelist, exerciselist, lemmalist, maintheoremlist, notationlist, propositionlist, questionlist, remarklist, theoremlist and prooflist corresponding to the above mathematical environments. They allow to control the appearance of the item lists individually. The items will be numbered in italic and can be referred to using the command \ref{item:MyLabel}. Currently, all the lists are styled the same way, but this can individually be changed

easily. The lists are build using the `enumitem` package. You can use all options that are available by the `enumitem` package also for these lists.

`cptenum` `cptitem` `cptdesc`

Beside these mathematical environments we also provide generic compact lists: `cptenum`, `cptitem`, and `cptdesc` similar to the lists from the `paralist` package.

2.5 Logo Support

`\nchairxheader`

The nChairX package provides two macros for your personal logo. With

```
\nchairxheader
```

you obtain a header logo with the full textwidth. It uses the file `nchairxheader.pdf` which has to be in your LaTeX search path.

`\nchairxlogo`

The other logo `\nchairxlogo` is smaller and can be used with a specific width as argument. It includes the file `nchairxlogo.pdf` which has to be in the search path as well. The argument is the width in a valid LaTeX unit producing e.g.  .

3 The Math Macros

One of the main purposes of `nchairx` is to provide several (in fact, many) new math macros needed in various situations: we have support for many things in differential geometry, algebra, and functional analysis. The math macros can be used independently of the full `nchairx` package under the name `chairxmath`. However, `nchairx` always includes the math macros.

3.1 The Handling of the Fonts

The package uses different fonts for different groups of macros. The font used for a particular macro is mentioned in the description of that macro. The groups of fonts are:

- `algebrafont` for generic algebras.
  Can be accessed via `\algebra`.
  Default font: `\mathscr`
- `basisfont` for bases of vector spaces.
  Can be accessed via `\basis`.
  Default font: `\mathit`
- `categoryfont` for generic categories.
  Can be accessed via `\category`.
  Default font: `\mathfrak`
- `categorynamefont` for predefined categories.
  Can be accessed via `\categoryname`.
  Default font: `\mathsf`

- `fieldfont` for generic fields.
  Can be accessed via `\field`.
  Default font: `\mathbb`
- `filterfont` for generic filters.
  Can be accessed via `\filter`.
  Default font: `\mathfrak`
- `functorfont` for generic functors.
  Can be accessed via `\functor`.
  Default font: `\mathsf`
- `gerstenhaberfont` for generic Gerstenhaber algebras.
  Can be accessed via `\gerstenhaber`.
  Default font: `\mathfrak`
- `groupfont` for the matrix groups.
  Can be accessed via `\group`.
  Default font: `\mathrm`
- `groupoidfont` for generic groupoids.
  Can be accessed via `\groupoid`.
  Default font: `\mathfrak`
- `hilbertfont` for Hilbert spaces.
  Can be accessed via `\hilbert`.
  Default font: `\mathfrak`
- `liealgfont` for generic Lie algebras.
  Can be accessed via `\liealg`.
  Default font: `\mathfrak`
- `modulefont` for generic modules.
  Can be accessed via `\module`.
  Default font: `\mathscr`
- `prehilbfont` for pre-Hilbert space.
  Can be accessed via `\prehilb`.
  Default font: `\mathcal`
- `operatorfont` for most common operators.
  Can be accessed via `\operator`.
  Default font: `\mathrm`
- `ringfont` for generic rings.
  Can be accessed via `\ring`.
  Default font: `\mathsf`
- `scriptfont` for subscripts.
  Can be accessed via `\script`.
  Default font: `\mathrm`

- `sheaffont` for generic sheaves.
  Can be accessed via `\sheaf`.
  Default font: `\mathscr`
- `spacesfont` for predefined function spaces, e.g. `\Bounded`
  Default font: `\mathscr`
- `topologyfont` for generic topologies.
  Can be accessed via `\topology`
  Default font: `\mathscr`

`\chairxfonts` The `\chairxfonts` macro can be used to redefine the fonts of the different groups of macros. It takes as argument a comma separated list of group names and the new font macros, e.g.

```
\chairxfonts{algebrafont = \mathfrak, scriptfont = \mathrm}
```

3.2 New Delimiter Sizes

We use `\DeclarePairedDelimiters` to generate all kind of bracket expressions of variable size as used e.g. in differential geometry. This has the big advantage that one has two options to set the size of the brackets: either with an explicit optional argument `\big`, ..., `\Bigg`, `\vast`, or `\Vast` like

`\Schouten[\vast]{X, Y}`: $\left[\!\!\left[X, Y \right]\!\!\right]_{\mathrm{S}}$

or you can use the *-version which produces automatic sizes via `\left` and `\right`.

`\abs*{\lim\limits_{n\to\infty} b_n}` yields $\left|\lim_{n\to\infty} b_n\right|$

Note, however, that this will typically result in sub-optimal spacing. Also, the brackets turn out to be typically too large.

Note that using the bracket constructions with `\DeclarePairedDelimiters` gives typically much better spacing than doing things by hand:

good `\abs{\det(A)}`: $|\det(A)|$ bad `|\det(A)|`: $|\det(A)|$

`\vast` `\Vast` `\vastl` `\vastm` `\vastr` `\Vastl` `\Vastm` `\Vastr` In many formulas one needs large delimiters typically ranging from `\big` to `\Bigg`. However, in very large formula constructions even that is not enough. To have a systematic enlargement the following delimiters sizes are introduced: `\vast` and `\Vast` together with the corresponding helper macros `\vastl`, `\vastr`, `\vastm`, `\Vastl`, `\Vastr`, and `\Vastm` needed to define pairs of delimiters. They allow to produce large (pairs of) delimiters, always provided that the corresponding font has the symbols in the correct size.

The following commands allow for an option size argument:

- Absolute value `\abs`
- Generic norm `\norm`
- Supremum norm `\supnorm`
- Essential supremum norm `\essupnorm`
- Dirac ket `\ket`
- Dirac bra `\bra`
- Dirac ketbra `\ketbra`
- Dirac braket `\braket`
- Schouten bracket `\Schouten`
- Nijenhuis-Richardson bracket `\NRbracket`
- Frölicher-Nijenhuis bracket `\FNbracket`
- Courant bracket `\Courant`
- Dorfman bracket `\Dorfman`
- Generic scalar product `\SP`
- Generic inner product with decorations `\IP`
- Restriction of a map `\at`
- Étalé space of a presheaf `\etale`

3.3 Decoration

We use the `tensor` package and modify things slightly to fit our needs: we provide a decoration command that allows to decorate arbitrary math symbols from left and right, top and bottom with other math symbols. This can be used to produce tensors with many indices. However, this is far too useful to be restricted to tensors only. The original `\tensor` macro from the `tensor package` is still available under the name `\originaltensor`. Note, that the `\tensor` command in `nchairx` is intended for the symbol of tensor product, and not for decorating a symbol with indices.

`\decorate` Decorate a symbol from all sides. The option argument gives the decoration in front of the symbol, the first argument the symbol, the second (mandatory) argument the decoration after the symbol. For each decoration several superscripts and subscripts can be used like `\decorate[^a_b^c]{S}{_d^{rt}_e}`: ${}^{a}_{b}{}^{c}S_{d}{}^{rt}_{e}$.

`\deco` We also provide a simpler version of `\decorate` called `\deco` which takes five usual arguments and sets them as sub- and superscripts before and after the middle symbol `\deco{a}{b}{c}{d}{e}`:${}^{a}_{b}c^{d}_{e}$ This can be used to define your

own macros with decoration. E.g. for bimodules over rings one could define `\newcommand{\bimodule}[3]{\deco{}{\ring{#1}{\module{#2}}{}{\ring{#3}}}}` which can then be used as `\bimodule{R}{E}{S}`: ${}_{\mathsf{R}}\mathscr{E}_{\mathsf{S}}$.

`\script` Sets the argument in the `scriptfont` and hence allows to create macros with fonts consistent with the other `nchairx` macros.

3.4 General Mathematics Macros

3.4.1 General Math Commands

`\I` Imaginary unit `\I`: i

`\E` Euler number `\E`: e

`\D` Differential `\D x`: $\mathrm{d}x$

`\cc` Complex conjugation `z \mapsto \cc{z}`: $z \mapsto \overline{z}$

`\sign` Signum `\sign \sigma`: $\operatorname{sign}\sigma$
Uses `operatorfont`.

`\RE` Real part (the standard symbols are sooo ugly) `\RE(z)`: $\operatorname{Re}(z)$
Uses `operatorfont`.

`\IM` Imaginary part `\IM(z)`: $\operatorname{Im}(z)$
Uses `operatorfont`.

`\Unit` Unit element `\Unit`: $\mathbb{1}$

`\const` Generic constant `\const`: *const*
Uses `mathit` as font.

`\canonical` Subscript for canonical `\omega_\canonical`: ω_{can}
Uses `scriptfont`.

`\pt` A single point `\{\pt\}`: {pt}
Uses `operatorfont`

3.4.2 Restrictions

`\at` Restriction of a map to a subset `f\at{U}`: $f\big|_U$ or with optional size `f\at[\Big]{U}`: $f\Big|_U$.
Default size is `\big`.

3.4.3 Maps and Related Stuff

`\Map` Space of maps `\Map(X, Y)`: $\operatorname{Map}(X,Y)$
Uses `operatorfont`.

`\Bij` Space of bijections `\Bij(X, Y)`: $\operatorname{Bij}(X,Y)$
Uses `operatorfont`.

`\argument` Generic argument of a map `f(\argument)`: $f(\cdot)$

`\domain` Domain of a map `\domain(\phi)`: $\operatorname{dom}(\phi)$
Uses `operatorfont`.

`\range` Range of a map `\range(\phi)`: $\operatorname{range}(\phi)$
Uses `operatorfont`.

`\id` Identity map `\id`: id

Uses operatorfont.

`\pr` Generic projection `\pr \colon E \to M`: pr: $E \to M$
Uses operatorfont.

`\inv` Inversion map `\inv \colon g \mapsto g^{-1}`: inv: $g \mapsto g^{-1}$
Uses operatorfont.

`\ev` Evaluation map `\ev \colon V \tensor V^* \to \mathbb{k}`: ev: $V \otimes V^* \to \Bbbk$
Uses operatorfont.

`\image` Image of a map `\image(f)`: $\operatorname{im}(f)$
Uses operatorfont.

`\graph` Graph of a map `\graph(f)`: $\operatorname{graph}(f)$
Uses operatorfont.

`\coimage` Coimage of a map `\coimage(f)`: $\operatorname{coim}(f)$
Uses operatorfont.

`\coker` Cokernel of a map `\coker(f)`: $\operatorname{coker}(f)$
Uses operatorfont.

`\operator` This macro allows to construct own mathematical operators whose fonts are consistent with the predefined operators of `nchairx \operator{asso}`: asso
Uses operatorfont.

3.4.4 Relations

`\later` Later in a directed set `i \later j`: $i \succcurlyeq j$

`\earlier` Earlier in a directed set `i \earlier j`: $i \preccurlyeq j$

3.4.5 Big Sums and Products

`\bigplus` A big plus sign that can be decorated with limits. Similar to the usual sum it can be used inline `\bigplus_{k=1}^n V_k`: $+_{k=1}^{n} V_k$ and in displaystyle:

$$\bigplus_{k=1}^{n} V_k$$

`\bigtimes` A big times sign that can be decorated with limits. Similar to the usual sum it can be used inline `\bigtimes_{k=1}^n V_k`: $\times_{k=1}^{n} V_k$ and in displaystyle:

$$\bigtimes_{k=1}^{n} V_k$$

`\biprod` A biproduct sign that can be decorated with limits. Similar to the usual sum it can be used inline `\biprod_{k=1}^n V_k`: $\prod_{k=1}^{n} V_k$ and in displaystyle:

$$\biprod_{k=1}^{n} V_k$$

3.4.6 Labels

In proofs we sometimes want to label an equation by a symbol and not by an equation number. Typical choices are of course (∗) or (∗∗). But as proofs become longer, some additional labels are nice to have:

`\smiley` A smiley `\smiley` ☺

`\frownie` A frownie `\frownie` ☹

`\heart` A heart `\heart` ♡

3.5 Algebra

3.5.1 Fonts for Rings and Things

`\field` Font for rings `\field{R}`: $\mathbb{R}$
Uses `fieldfont`.

`\ring` Font for rings `\ring{C}`: C
Uses `ringfont`.

`\group` Font for particular (matrix) groups `\group{SO}(3)`: $\mathrm{SO}(3)$
Uses `groupfont`.

`\algebra` Font for algebras `\algebra{A}`: $\mathscr{A}$
Uses `algebrafont`.

`\module` Font for modules `\module{M}`: $\mathscr{M}$
Uses `modulefont`.

`\liealg` Font for Lie algebras `\liealg{g}`: $\mathfrak{g}$
Uses `liealgfont`.

`\MC` MC for Maurer-Cartan as a tiny index `\mu_\MC \in \liealg{g}^1`: $\mu_{\mathrm{MC}} \in \mathfrak{g}^1$
Uses `scriptfont`.

`\gerstenhaber` Font for Gerstenhaber algebras `\gerstenhaber{G}`: $\mathfrak{G}$
Uses `gerstenhaberfont`.

3.5.2 Some Symbols needed in Algebra

`\Pol` Polynomials and polynomial functions `\Pol(T^*Q)`: $\mathrm{Pol}(T^*Q)$
Uses `operatorfont`.

`\lmult` Left multiplications `\lmult_a`: ℓ_a
Uses `operatorfont`.

`\rmult` Right multiplications `\rmult_b`: r_b
Uses `operatorfont`.

`\Lmult` Left multiplications `\Lmult_a`: L_a
Uses `operatorfont`.

`\Rmult` Right multiplications `\Rmult_b`: R_b
Uses `operatorfont`.

`\Center` Center `\Center(\algebra{A})`: $\mathscr{Z}(\mathscr{A})$

`\ad` Adjoint action (infinitesimal) `\ad(a)`: $\mathrm{ad}(a)$
Uses `operatorfont`.

`\Ad` Adjoint action `\Ad_g`: Ad_g
Uses `operatorfont`.

`\Conj` Conjugation `\Conj_g`: Conj_g
Uses `operatorfont`.

`\acts` A generic (left) action map `g \acts a`: $g \triangleright a$

`\racts` A generic right action map `a \racts g`: $a \triangleleft g$

`\Char` Characteristics of a field `\Char(\mathbb{k})`: $\mathrm{char}(\Bbbk)$
Uses `operatorfont`.

`\modulo` Yet another modulo `n \modulo 2`: $n \bmod 2$
Uses `operatorfont`.

`\Clifford` Clifford algebra generated by a vector space and a bilinear form: `\Clifford(V, h)`: $\mathrm{Cl}(V, h)$
Uses `operatorfont`.

`\cClifford` Complex Clifford algebra `\cClifford(V, h)`: $\mathbb{C}\mathrm{l}(V, h)$
Uses `operatorfont`.

`\Der` ($*$-)Derivations `\Der(\algebra{A})`: $\mathrm{Der}(\mathscr{A})$
`\Der*(\algebra{A})`: ${}^*\text{-}\mathrm{Der}(\mathscr{A})$
Uses `operatorfont`.

`\InnDer` Inner ($*$-)derivations `\InnDer(\algebra{A})`: $\mathrm{InnDer}(\mathscr{A})$
`\InnDer*(\algebra{A})`: ${}^*\text{-}\mathrm{InnDer}(\mathscr{A})$
Uses `operatorfont`.

`\OutDer` Outer ($*$-)derivations `\OutDer(\algebra{A})`: $\mathrm{OutDer}(\mathscr{A})$
`\OutDer*(\algebra{A})`: ${}^*\text{-}\mathrm{OutDer}(\mathscr{A})$
Uses `operatorfont`.

`\InnAut` Inner ($*$-)automorphisms `\InnAut(\algebra{A})`: $\mathrm{InnAut}(\mathscr{A})$
`\InnAut*(\algebra{A})`: ${}^*\text{-}\mathrm{InnAut}(\mathscr{A})$
Uses `operatorfont`.

`\OutAut` Outer ($*$-)automorphisms `\OutAut(\algebra{A})`: $\mathrm{OutAut}(\mathscr{A})$
`\OutAut*(\algebra{A})`: ${}^*\text{-}\mathrm{OutAut}(\mathscr{A})$
Uses `operatorfont`.

`\formal` Formal power series in some variables `V\formal{\lambda}`: $V[\![\lambda]\!]$

`\laurent` Formal Laurent series in some variables `V\laurent{\lambda}`: $V(\!(\lambda)\!)$

`\sweedler` Smaller index for Sweedler notation in Hopf algebra theory
`\Delta(a) = a_\sweedler{1} \tensor a_\sweedler{2}`: $\Delta(a) = a_{(1)} \otimes a_{(2)}$

3.5.3 Categories from Algebra

`\algebras` Category of algebras `\algebras`: alg
Category of $*$-algebras `\algebras*`: ${}^*\mathsf{alg}$
Uses `categorynamefont`.

`\Algebras` Category of unital algebras `\Algebras`: Alg
Category of unital $*$-algebras `\Algebras*`: ${}^*\mathsf{Alg}$
Uses `categorynamefont`.

`\reps` Category of ($*$-)representations `\reps_\algebra{C}(\algebra{B})`: $\mathsf{rep}_{\mathscr{C}}(\mathscr{B})$
`\reps*_\algebra{C}(\algebra{B})`: ${}^*\mathsf{rep}_{\mathscr{C}}(\mathscr{B})$
Uses `categorynamefont`.

`\Reps` Category of strongly non-degenerate (*)-representations `\Reps_\algebra{A}(\algebra{B})`:$\mathsf{Rep}_{\mathscr{A}}(\mathscr{B})$

	\Reps*_\algebra{A}(\algebra{B}):*-Rep$_{\mathscr{A}}(\mathscr{B})$ Uses categorynamefont.
\PoissonAlg	Category of ($*$-)Poisson algebras \PoissonAlg: PoissonAlg \PoissonAlg*: *-PoissonAlg Uses categorynamefont.
\modules	Category of (inner product) modules \modules_\algebra{A}(\algebra{B}): mod$_{\mathscr{A}}(\mathscr{B})$ \modules*_\algebra{A}(\algebra{B}): *-mod$_{\mathscr{A}}(\mathscr{B})$ Uses categorynamefont.
\Leftmodules	Category of left modules \Leftmodules{\algebra{A}}: $\mathscr{A}$-mod Uses categorynamefont.
\Rightmodules	Category of right modules with optional subscript \Rightmodules[\category{C}]{\algebra{A}}: mod$_{\mathfrak{C}}$-$\mathscr{A}$ Uses categorynamefont.
\Modules	Category of strongly non-degenerate (inner product) modules \Modules_\algebra{A}(\algebra{B}): Mod$_{\mathscr{A}}(\mathscr{B})$ \Modules*_\algebra{A}(\algebra{B}): *-Mod$_{\mathscr{A}}(\mathscr{B})$ Uses categorynamefont.
\LeftModules	Category of strongly non-degenerate left modules \LeftModules{\algebra{A}}: $\mathscr{A}$-Mod Uses categorynamefont.
\RightModules	Category of strongly non-degenerate right modules with optional subscript \RightModules{\algebra{A}}: Mod-$\mathscr{A}$ or \RightModules[\category{C}]{\algebra{A}}: Mod$_{\mathfrak{C}}$-$\mathscr{A}$ Uses categorynamefont.
\Bimodules	Category of (inner product) bimodules \Bimodules(\algebra{A},\algebra{B}): Bimod$(\mathscr{A},\mathscr{B})$ \Bimodules*(\algebra{A},\algebra{B}): *-Bimod$(\mathscr{A},\mathscr{B})$ Uses categorynamefont.
\Rings	Category of unital rings (meant to be associative) \Rings: Ring Uses categorynamefont.
\Groups	Category of groups \Groups: Group Uses categorynamefont.
\Ab	Category of abelian groups \Ab: Ab Uses categorynamefont.
\Lattices	Category of lattices \Lattices: Lattice Uses categorynamefont.
\Sets	Category of sets \Sets: Set Uses categorynamefont.
\Vect	Category of vector spaces \Vect: Vect Uses categorynamefont.
\LieAlgs	Category of Lie algebras \LieAlgs: LieAlg Uses categorynamefont.
\Posets	Category of partially ordered sets \Posets: Poset Uses categorynamefont.
\Directed	Category of directed sets \Directed: Directed

Uses categorynamefont.

\GSets Category of G-Sets \GSets: G-Set and \Gsets[H]: H-Set
Uses categorynamefont.

\Groupoids Category of groupoids \Groupoids: Groupoid
Uses categorynamefont.

3.6 Analysis

3.6.1 General Anyalsis Macros

\vol Volume \vol: vol
Uses operatorfont

\complete Completion of some space \complete{V}: $\widehat{V}$

\Ball Open ball \Ball_{r}(p): $\mathrm{B}_r(p)$

\abs Generic absolute value \abs{x}: $|x|$

\norm Generic norm \norm{v}: $\|v\|$

\supnorm Supremum norm \supnorm{f}: $\|f\|_\infty$

\expands Formal expansions f(t) \stackrel{t \to 0}{\expands} t^k: $f(t) \overset{t\to 0}{\sim} t^k$,
or with optional stretching factor (default is 2.5) a \expands[4] b: $a \overset{}{\sim\!\sim\!\sim} b$.

3.6.2 Pseudodifferential Operators

\std Standard ordering as small subscript \sigma_\std: σ_{std}
Uses scriptfont

\Weyl Weyl ordering as small subscript \sigma_\Weyl: σ_{Weyl}
Uses scriptfont

\Op Operator for a symbol \Op(f): $\mathrm{Op}(f)$
Uses operatorfont

\Opstd Standard ordered operator for a symbol \Opstd(f): $\mathrm{Op}_{\mathrm{std}}(f)$
Uses operatorfont

\OpWeyl Weyl ordered operator for a symbol \OpWeyl(f): $\mathrm{Op}_{\mathrm{Weyl}}(f)$
Uses operatorfont

3.6.3 Function Spaces

\spacename Font for specific functional spaces \spacename{F}(X): $\mathscr{F}(X)$
Uses spacefont.

\Bounded Bounded functions \Bounded(X): $\mathscr{B}(X)$
Uses spacefont.

\Continuous Continuous functions \Continuous(X): $\mathscr{C}(X)$
Uses spacefont.

\Contbound Continuous bounded functions \Contbound(X): $\mathscr{C}_{\mathrm{b}}(X)$
Uses spacefont.

\Fun C^k-functions (for $\mathscr{C}$ use \Continuous) \Fun(M): $\mathscr{C}^k(M)$ and \Fun[\ell](M): $\mathscr{C}^\ell(M)$
Uses spacefont.

`\Cinfty` Smooth functions `\Cinfty`: $\mathscr{C}^\infty(M)$
Uses `spacefont`.

`\Comega` Real-analytic functions `\Comega`: $\mathscr{C}^\omega(M)$
Uses `spacefont`.

`\Holomorphic` Holomorphic functions `\Holomorphic`: $\mathscr{O}(U)$
Uses `spacefont`.

`\AntiHolomorphic` Anti-holomorphic functions `\AntiHolomorphic`: $\overline{\mathscr{O}}(U)$
Uses `spacefont`.

`\Schwartz` Schwartz space `\Schwartz`: $\mathscr{S}(\mathbb{R}^n)$
Uses `spacefont`.

`\Riemann` Riemann integrable functions `\Riemann([a, b])`: $\mathscr{R}([a,b])$
Uses `spacefont`.

3.6.4 Locally Convex Analysis and Distributions

`\singsupp` Singular support of a distribution `\singsupp u`: $\operatorname{sing\,supp} u$

`\seminorm` Font for generic seminorm `\seminorm{p}`: p

`\ord` Order of a distribution `\ord(u)`: $\operatorname{ord}(u)$

`\conv` Convex hull `\conv(A)`: $\operatorname{conv}(A)$

`\extreme` Extreme points `\extreme(A)`: $\operatorname{extreme}(A)$

3.6.5 Hilbert Spaces and Operators

`\hilbert` Font for Hilbert spaces `\hilbert{H}`: $\mathfrak{H}$
Uses `hilbertfont`

`\prehilb` Font for pre-Hilbert spaces `\prehilb{H}`: $\mathcal{H}$
Uses `prehilbfont`.

`\Adjointable` Adjointable operators `\Adjointable(\hilbert{H})`: $\mathfrak{B}(\mathfrak{H})$ or with optional argument `\Adjointable[\algebra{A}](\hilbert{H})`: $\mathfrak{B}_{\mathscr{A}}(\mathfrak{H})$ if we have a Hilbert module over an algebra $\mathscr{A}$ instead.

`\Finite` Finite rank operators `\Finite(\hilbert{H})`: $\mathfrak{F}(\mathfrak{H})$ or with optional argument `\Finite[\algebra{A}](\module{H})`: $\mathfrak{F}_{\mathscr{A}}(\mathscr{H})$

`\Compact` Compact operators `\Compact(\hilbert{H})`: $\mathfrak{K}(\mathfrak{H})$ or with optional argument `\Compact[\algebra{A}](\module{H})`: $\mathfrak{K}_{\mathscr{A}}(\mathscr{H})$

`\opdomain` Domain of definition of an operator `\opdomain(A)`: $\mathfrak{D}(A)$
Uses `\hilbertfont`.

`\spec` Spectrum of an operator `\spec(A)`: $\operatorname{spec}(A)$
Uses `operatorfont`.

`\closure` Closure of an operator `\closure{A}`: $\overline{A}$

`\res` Resolvent set of an operator `\res(A)`: $\operatorname{res}(A)$
Uses `operatorfont`.

`\Res` Resolvent of an operator `\Res_z(A)`: $\operatorname{Res}_z(A)$
Uses `operatorfont`.

`\specrad` Spectral radius of an operator `\specrad(A)`: $\varrho(A)$

`\slim` Strong limit `\slim_{n \longrightarrow \infty} A_n`: $\text{s-}\lim_{n\longrightarrow\infty} A_n$

`\wlim` Weak limit `\wlim_{n \longrightarrow \infty} A_n`: $\text{w-}\lim_{n\longrightarrow\infty} A_n$

3.6.6 Dirac's Bra and Ket Notation

`\bra` Dirac bra `\bra{\psi}`: $\langle\psi|$
`\ket` Dirac ket `\ket{\phi}`: $|\phi\rangle$
`\braket` Dirac braket `\braket{\phi}{\psi}`: $\langle\phi\,|\,\psi\rangle$
`\ketbra` Dirac ketbra `\ketbra{\phi}{\psi}`: $|\phi\rangle\langle\psi|$

3.6.7 Operator Algebras

`\Spec` Spectrum of an algebra `\Spec(\algebra{A})`: $\mathrm{Spec}(\mathscr{A})$
Uses `operatorfont`.
`\Rad` Radical of an algebra `\Rad(\algebra{A})`: $\mathrm{Rad}(\mathscr{A})$
Uses `operatorfont`.
`\ind` Fredholm index (`\index` is already used!) `\ind(A)`: $\mathrm{ind}(A)$
Uses `operatorfont`.

3.6.8 Measure Theory and Integration

Here we need various function space of integrable functions (calligraphic ones) and the corresponding quotients by zero functions (roman ones):
`\Measurable` Measurable functions `\Measurable(X)`: $\mathscr{M}(X)$
Uses `operatorfont`.
`\Meas` Complex measures `\Meas(X)`: $\mathrm{Meas}(X)$
Uses `operatorfont`.
`\BoundMeas` Bounded measurable functions `\BoundMeas(X)`: $\mathscr{BM}(X)$
Uses `spacefont`.
`\Lp` Equivalence classes of p-integrable functions (p is an optional argument) `\Lp(X)`: $\mathrm{L}^p(X)$ and `\Lp[q](X)`: $\mathrm{L}^q(X)$
`\Lone` Equivalence classes of integrable functions `\Lone(X)`: $\mathrm{L}^1(X)$
`\Ltwo` Equivalence classes of square integrable functions `\Ltwo(X)`: $\mathrm{L}^2(X)$
`\Linfty` Equivalence classes of essentially bounded functions `\Linfty(X)`: $\mathrm{L}^\infty(X)$
`\Intp` Space of p-integrable functions `\Intp(X)`: $\mathscr{L}^p(X)$ and with optional argument `\Intp[q](X)`: $\mathscr{L}^q(X)$
`\Intone` Space of integrable functions `\Intone(X)`: $\mathscr{L}^1(X)$
`\Inttwo` Space of square integrable functions `\Inttwo(X)`: $\mathscr{L}^2(X)$
`\Intinfty` Space of essentially bounded functions `\Intinfty(X)`: $\mathscr{L}^\infty(X)$
`\essrange` Essential range `\essrange(f)`: $\operatorname{ess\,range}(f)$
Uses `operatorfont`.
`\esssup` Essential supremum `\esssup(f)`: $\operatorname{ess\,sup}(f)$
Uses `operatorfont`.
`\esssupnorm` Essential supremum norm `\esssupnorm{f}`: $\|f\|_{\operatorname{ess\,sup}}$
Uses `operatorfont`.
`\ac` Absolutely continuous part of a measure `\mu_\ac`: μ_{ac}
Uses `scriptfont`.
`\sing` Singular part of a measure `\mu_\sing`: μ_{sing}
Uses `scriptfont`.

3.6.9 Limits

`\indlim` Inductive (or direct) limit `\indlim_{i \in I} A_i`: $\operatorname{ind\,lim}_{i\in I} A_i$
Uses `operatorfont`.

`\projlim` Projective (or inverse) limit `\projlim_{i \in I} A_i`: $\operatorname{proj\,lim}_{i\in I} A_i$
Uses `operatorfont`.

3.7 Category Theory

3.7.1 General Category Theory

`\category` Font for generic categories `\category{C}`: $\mathfrak{C}$
Uses `categoryfont`.

`\categoryname` Font for specific categories `\categoryname{FinSet}`: FinSet
Uses `categorynamefont`.

`\functor` Font for functors `\functor{F}`: F
Uses `functorfont`.

`\groupoid` Font for groupoids `\groupoid{G}`: $\mathfrak{G}$
Uses `groupoidfont`.

`\source` Source of arrow `\source(f)`: $\operatorname{source}(f)$
Uses `operatorfont`.

`\target` Target of arrow `\target(f)`: $\operatorname{target}(f)$
Uses `operatorfont`.

`\unit` Unit map in groupoids `\unit\colon M \longrightarrow G`: unit: $M \longrightarrow G$
Uses `operatorfont`.

`\opp` Opposite category etc. `\category{C}^\opp`: $\mathfrak{C}^{\mathrm{opp}}$
Uses `scriptfont`.

`\asso` Natural transformation of associativity `\asso`: asso
Uses `operatorfont`.

`\Hom` Homomorphisms `\Hom(A, B)`: $\operatorname{Hom}(A, B)$
Uses `operatorfont`.

`\End` Endomorphisms `\End(E)`: $\operatorname{End}(E)$
Uses `operatorfont`.

`\Aut` ($*$-)Automorphisms `\Aut(A)`: $\operatorname{Aut}(A)$
`\Aut*(A)`: ${}^*\operatorname{-Aut}(A)$
Uses `operatorfont`.

`\Iso` ($*$-)Isomorphisms `\Iso(A, B)`: $\operatorname{Iso}(A, B)$
`\Iso*(A, B)`: ${}^*\operatorname{-Iso}(A, B)$
Uses `operatorfont`.

`\Obj` Objects of a category `\Obj(\category{C})`: $\operatorname{Obj}(\mathfrak{C})$
Uses `operatorfont`.

`\Morph` Morphisms of a category `\Morph(a, b)`: $\operatorname{Morph}(a, b)$
Uses `operatorfont`.

3.7.2 Colimits

`\colim` Colimits of diagrams or functors: `\colim \functor{F}`: $\operatorname{colim}\mathsf{F}$

3.8 Differential Geometry

3.8.1 General Macros in Differential Geometry

`\Lie` Lie derivative `\Lie_X f`: $\mathscr{L}_X f$

`\Schouten` Schouten bracket `\Schouten{X,Y}`: $[\![X, Y]\!]_{\mathrm{S}}$.

`\Forms` Differential forms `\Forms(M)`: $\Omega(M)$

`\ZdR` DeRham cocycles `\ZdR(M, \mathbb{C})`: $\mathrm{Z}_{\mathrm{dR}}(M, \mathbb{C})$
Uses `operatorfont`.

`\BdR` DeRham coboundaries `\BdR(M, \mathbb{C})`: $\mathrm{B}_{\mathrm{dR}}(M, \mathbb{C})$
Uses `operatorfont`.

`\HdR` DeRham cohomology `\HdR(M, \mathbb{C})`: $\mathrm{H}_{\mathrm{dR}}(M, \mathbb{C})$
Uses `operatorfont`.

`\Diffeo` Diffeomorphism group `\Diffeo(M)`: $\mathrm{Diffeo}(M)$
Uses `operatorfont`.

`\Diffop` Differential operators `\Diffop(M)`: $\mathrm{DiffOp}(M)$
Uses `operatorfont`.

`\loc` To be used as an index `M_\loc`: M_{loc}
Uses `scriptfont`.

`\germ` Germs of functions `\germ_p(f)`: $\mathrm{germ}_p(f)$
Uses `operatorfont`.

`\prol` Prolongation map `\prol(f)`: $\mathrm{prol}(f)$
Uses `operatorfont`.

`\NRbracket` Nijenhuis-Richardson bracket `\NRbracket{a, b}`: $[a, b]_{\mathrm{NR}}$
Uses `scriptfont`.

`\FNbracket` Fröhlicher-Nijenhuis bracket `\FNbracket{a, b}`: $[a, b]_{\mathrm{FN}}$
Uses `scriptfont`.

`\Manifolds` The category of manifolds `\Manifolds`: Manifold
Uses `categorynamefont`

3.8.2 Lie Groups and Principal Fiber Bundles

`\lefttriv` Left trivialization `\lefttriv`: left
Uses `operatorfont`.

`\righttriv` Right trivialization `\righttriv`: right
Uses `operatorfont`.

`\Gau` Gauge group `\Gau(P)`: $\mathrm{Gau}(P)$
Uses `operatorfont`.

`\Conn` Connection one-forms `\Conn(P)`: $\mathrm{Conn}(P)$
Uses `operatorfont`.

`\ratio` Ratio map of principal fiber bundle `\ratio(u, v)`: $\mathrm{r}(u, v)$
Uses `operatorfont`.

`\Parallel` Parallel transport `\Parallel_{0 \to 1, \gamma}(v)`: $\mathrm{P}_{0\to 1,\gamma}(v)$
Uses `operatorfont`.

`\CE` Chevalley-Eilenberg as index `C_\CE`: C_{CE}
Uses `scriptfont`.

`\HCE` Chevalley-Eilenberg cohomology `\HCE(\liealg{g})`: $\mathrm{H}_{\mathrm{CE}}(\mathfrak{g})$

Uses operatorfont.

`\fund` Trivialization by fundamental vector fields `\fund`: fund
Uses operatorfont.

`\Universal` Universal enveloping algebra `\Universal{\liealg{g}}`: $\mathrm{U}(\mathfrak{g})$
Uses operatorfont.

`\BCH` BCH as small index `\sigma_\BCH`: σ_{BCH}
Uses scriptfont.

`\LieGroups` The category of Lie groups `\LieGroups`: LieGroup
Uses categorynamefont.

`\Principal` The category of principal bundles `\Principal`: Principal
Uses categorynamefont.

`\GPrincipal` The category of G-principal bundles `\GPrincipal`: G-Principal
or with optional structure group `\GPrincipal[H]`: H-Principal
Uses categorynamefont.

`\Fiber` The category of fiber bundles `\Fiber`: Fiber Uses categorynamefont.

`\FFiber` The category of fiber bundles with typical fiber `\FFiber`: F-Fiber
or with specified typical fiber `\FFiber[X]`: X-Fiber
Uses categorynamefont.

`\Pin` The pin group `\Pin(q, p)`: $\mathrm{Pin}(p, q)$
Uses groupfont.

`\Spin` The spin group `\Spin(q, p)`: $\mathrm{Spin}(p, q)$
Uses groupfont.

3.8.3 (Pseudo-) Riemannian Geometry

`\nablaLC` Levi-Civita covariant derivative `\nablaLC_X Y`: $\nabla^{\mathrm{LC}}_X Y$
Uses scriptfont.

`\Laplace` Laplace operator `\Laplace f`: Δf

`\dAlembert` D'Alembert operator `\dAlembert u`: $\Box u$

`\feynman` Feynman slash notation `\feynman{D} = \feynman{A} + \feynman{\partial}`: $\not{D} = \not{A} + \not{\partial}$

`\Dirac` Dirac operator `\Dirac u`: $\not{D} u$

`\rotation` Rotation (i.e. curl) of a vector field `\rotation(X)`: $\mathrm{rot}(X)$. Not to be confused with grün(X).
Uses operatorfont.

`\curl` Curl of a vector field `\curl \vec{X}`: $\operatorname{curl} \vec{X}$
Uses operatorfont.

`\divergence` Divergence of a vector field `\divergence(X)`: $\mathrm{div}(X)$
Uses operatorfont.

`\gradient` Gradient of a function `\gradient f`: $\operatorname{grad} f$
Uses operatorfont.

`\Tor` Torsion of a covariant derivative `\Tor (X, Y)`: $\mathrm{Tor}(X, Y)$
Uses operatorfont.

`\Ric` Ricci curvature `\Ric (X, Y)`: $\mathrm{Ric}(X, Y)$
Uses operatorfont.

`\scal` Scalar curvature `\scal`: scal

Uses `operatorfont`.

`\Riem` The set of Riemannian metrics (linear and on manifolds) `\Riem(M)`: $\mathrm{Riem}(M)$
Uses `operatorfont`.

`\Hessian` Hessian of a function `\Hessian(f) \in \Secinfty(\Sym^2T^*M)`: $\mathrm{Hessian}(f) \in \Gamma^\infty(\mathrm{S}^2T^*M)$
Uses `operatorfont`.

`\hodge` Hodge star operator `\alpha \mapsto \hodge\alpha`: $\alpha \mapsto \star\alpha$

3.8.4 Complex Geometry

`\Nijenhuis` Nijenhuis operator `\Nijenhuis(X, Y)`: $\mathrm{Nij}(X,Y)$
Uses `operatorfont`.

`\del` Dolbeault operator `\del \omega`: $\partial\omega$

`\delbar` CC of Dolbeault operator `\delbar\alpha`: $\overline{\partial}\alpha$

`\FS` Fubini Study as very small index `\omega_\FS`: ω_{FS}
Uses `scriptfont`.

3.8.5 Vector Bundles

`\Lift` Generic lift of something `\nabla^\Lift`: ∇^{Lift}
Uses `scriptfont`.

`\ver` Vertical lift `X^\ver`: X^{ver}
Uses `scriptfont`.

`\hor` Horizontal lift `X^\hor`: X^{hor}
Uses `scriptfont`.

`\Ver` Vertical subbundle `\Ver(E)`: $\mathrm{Ver}(E)$
Uses `operatorfont`.

`\Hor` Horizontal subbundle `\Hor(E)`: $\mathrm{Hor}(E)$
Uses `operatorfont`.

`\Sec` C^k-sections `\Sec(E)`: $\Gamma^k(E)$ and `\Sec[2](E)`: $\Gamma^2(E)$

`\Secinfty` Smooth sections `\Secinfty(E)`: $\Gamma^\infty(E)$

`\HolSec` Holomorphic sections `\HolSec(U, E)`: $\Gamma_{\mathrm{hol}}(U,E)$
Uses `scriptfont`.

`\SymD` Symmetrized covariant derivative `\SymD^n f`: $\mathrm{D}^n f$
Uses `operatorfont`.

`\Densities` Densities of a vector bundle of rank n or specific rank `\Densities TM`: $|\Lambda^n|TM$ and `\Densities[k]^\alpha E`: $|\Lambda^k|^\alpha E$.

`\MeasurableSections` Measurable sections `\MeasurableSections(E)`: $\mathscr{M}\Gamma(E)$
Uses `spacefont`.

`\IntpSections` p-Integrable Sections `\IntpSections(\Densities T^*M)`: $\mathscr{L}^p\Gamma(|\Lambda^n|T^*M)$ or with optional argument `\IntpSections[q](\Densities T^*M)`: $\mathscr{L}^q\Gamma(|\Lambda^n|T^*M)$.

`\IntegrableSections` Integrable sections `\IntegrableSections(\Densities T^*M)`: $\mathscr{L}^1\Gamma(|\Lambda^n|T^*M)$

`\Translation` Fiber translations `\Translation_A`: T_A
Uses `operatorfont`.

`\frames` Font for local frames `\frames{e}_1, \ldots, \frames{e}_k`: $\mathrm{e}_1, \ldots, \mathrm{e}_k$
Uses `operatorfont`.

`\Frames` Frame bundle of a vector bundle `\Frames(E) \longrightarrow M`: $\mathrm{Frames}(E) \longrightarrow M$
Uses `operatorfont`.

`\FDiff` Fiber derivative `\FDiff L`: $\mathrm{F}L$
Uses `operatorfont`.

3.8.6 Symplectic and Poisson Geometry

`\Sympl` Symplectomorphism group `\Sympl(M, \omega)`: $\mathrm{Sympl}(M, \omega)$
Uses `groupfont`.

`\Jacobiator` Jacobiator `\Jacobiator`: Jac_π and `\Jacobiator[\nu]`: Jac_ν
Uses `operatorfont`.

`\red` Reduced as an index `M_\red`: M_{red}
Uses `scriptfont`.

`\Hess` Hess map `\Hess`: $\mathrm{Hess}(\nabla)$
Uses `operatorfont`.

`\KKS` KKS as tiny index `\{f, g\}_\KKS`: $\{f, g\}_{\mathrm{KKS}}$
Uses `scriptfont`.

`\Courant` Courant bracket `\Courant{a, b}`: $[\![a, b]\!]_{\mathrm{C}}$
Uses `scriptfont`.

`\Dorfman` Dorfman bracket `\Dorfman{(x, \xi), (y, \eta)}`: $[\![(x, \xi), (y, \eta)]\!]_{\mathrm{D}}$
Uses `scriptfont`

`\Dir` (Linear) Dirac structures `\Dir(V)`: $\mathrm{Dir}(V)$
Uses `operatorfont`.

`\Forward` Forward map `\Forward(\phi)`: $\mathcal{F}(\phi)$

`\Backward` Backward map `\Backward(\phi)`: $\mathcal{B}(\phi)$

`\Tangent` Generalized tangent bundle/map `\Tangent M`: $\mathbb{T}M$

`\MWreduction` Marsden-Weinstein reduction `M \MWreduction G`: $M /\!\!/ G$

`\Mon` Monodromy groupoid `\Mon(M)`: $\mathrm{Mon}(M)$
Uses `operatorfont`.

`\Hol` Holonomy groupoid `\Hol(M)`: $\mathrm{Hol}(M)$
Uses `operatorfont`.

3.9 Linear Algebra

3.9.1 General Linear Algebra

`\tr` Trace of a linear map `\tr(A)`: $\mathrm{tr}(A)$
Uses `operatorfont`.

`\rank` Rank of a linear map `\rank(A)`: $\mathrm{rank}(A)$
Uses `operatorfont`.

`\codim` Codimension `\codim U`: $\mathrm{codim}\, U$
Uses `operatorfont`.

`\diag` Diagonal (for filling matrices etc.) `\diag(1,-1, -1)`: $\mathrm{diag}(1, -1, -1)$
Uses `operatorfont`.

`\Trans` Transposition of matrices `A^\Trans`: A^{T}

Uses `scriptfont`.

`\Mat` Matrices `\Mat_n(\mathbb{R})`: $\mathrm{M}_n(\mathbb{R})$
Uses `operatorfont`.

`\SymMat` Symmetric matrices `\SymMat_n(\mathbb{R})`: $\mathrm{SymMat}_n(\mathbb{R})$
Uses `operatorfont`.

`\ann` Annihilator of a subspace `U^\ann`: U^{ann}
Uses `scriptfont`.

`\Span` Span of something `\Span\{v, u\}`: $\mathrm{span}\{v, u\}$ and with optional argument `\Span[\mathbb{C}]\{v,u\}`: $\mathrm{span}_{\mathbb{C}}\{v, u\}$
Uses `operatorfont`.

`\basis` Font for basis vectors `\basis{e}_i`: e_i
Uses `basisfont`.

3.9.2 Tensors

`\tensor` Generic tensor product over some ring `a \tensor b`: $a \otimes b$.
With optional subscript `V \tensor[\algebra{A}] U`: $V \otimes_{\mathscr{A}} U$

`\Tensor` Tensor powers, tensor algebra `\Tensor^\bullet(V)`: $\mathrm{T}^\bullet(V)$
Uses `operatorfont`.

`\Anti` Antisymmetric tensor powers, Grassmann algebra `\Anti(V)`: $\Lambda(V)$

`\Sym` Symmetric tensor powers, symmetric algebra `\Sym^\bullet(V)`: $\mathrm{S}^\bullet(V)$
Uses `operatorfont`.

`\Symmetrizer` Symmetrizer `\Symmetrizer_n`: Sym_n

`\AntiSymmetrizer` Anti-symmetrizer `\AntiSymmetrizer`: Alt

`\ins` Generic insertion map `\ins_X`: i_X
Uses `operatorfont`.

`\jns` Generic right insertion map `\jns_X`: j_X
Uses `operatorfont`.

`\insa` Antisymmetric insertion map `\insa(X)`: $\mathrm{i}_{\mathrm{a}}(X)$
Uses `operatorfont`, `scriptfont`.

`\inss` Symmetric insertion map `\inss(v)`: $\mathrm{i}_{\mathrm{s}}(v)$
Uses `operatorfont`, `scriptfont`.

`\dega` Antisymmetric degree `\dega(a) = ka`: $\deg_{\mathrm{a}}(a) = ka$
Uses `operatorfont`, `scriptfont`.

`\degs` Symmetric degree `\degs(X) = \ell X`: $\deg_{\mathrm{s}}(X) = \ell X$
Uses `operatorfont`, `scriptfont`.

3.9.3 Inner Products

`\SP` Simple scalar product `\SP{x, y}`: $\langle x, y\rangle$.

`\littlepara` Small parallel to be used as a subscript `v_\littlepara`: $v_{\shortparallel}$

`\IP` Generic inner product with five arguments to decorate it `\IP[]{}{}{}{}{}` and an optional argument to adjust the size:

$$ {}_{B}\big\langle z, w\big\rangle_{R}^{\perp} \quad \text{and} \quad {}_{\mathscr{B}}^{\perp}\Big\langle \prod x_i, y\Big\rangle_{\mathscr{A}}^{\prime} $$

3.10 Statistics

3.10.1 Macros for General Statistics

`\EX` Expectation value `\EX_\omega(A)`: $\mathrm{E}_\omega(A)$
Uses `operatorfont`.

`\Var` Variance `\Var(a)`: $\mathrm{Var}(a)$
Uses `operatorfont`.

`\Cov` Covariance `\Cov_\omega(a, b)`: $\mathrm{Cov}_\omega(a, b)$
Uses `operatorfont`.

`\Cor` Correlation `\Cor(a, b)`: $\mathrm{Cor}(a, b)$
Uses `operatorfont`.

3.11 Topology

3.11.1 Macros for Topology

`\cl` Topological closure `X^\cl`: X^{cl}
Uses `scriptfont`.

`\scl` Sequential closure `A^\scl`: A^{scl}
Uses `scriptfont`.

`\interior` Open interior `A^\interior`: A°

`\boundary` Boundary of a subset `\boundary A`: ∂A

`\supp` Support of a function `\supp f`: $\operatorname{supp} f$
Uses `operatorfont`.

`\dist` Distance `\dist(p, A)`: $\operatorname{dist}(p, A)$
Uses `operatorfont`.

`\topology` Font for topology `\topology{M}`: $\mathscr{M}$
Uses `topologyfont`.

`\filter` Font for filter `\filter{F}`: $\mathfrak{F}$
Uses `filterfont`.

`\sheaf` Font for sheaves `\sheaf{F}`: $\mathscr{F}$
Uses `sheaffont`.

`\Sections` Discontinuous sections of a presheaf `\Sections(\sheaf{F})`: $\mathrm{Sections}(\mathscr{F})$
Uses `operatorfont`.

`\HOM` Sheaf of morphisms between sheaves `\HOM(\sheaf{F}, \sheaf{G})`: $\mathscr{H}om(\mathscr{F}, \mathscr{G})$
Uses `sheaffont` and `\mathit`.

`\etale` Étalé space of presheaf `\etale{\sheaf{F}}`: $|\mathscr{F}|$.

3.11.2 Categories from Topology

`\topological` Category of topological spaces `\topological`: top
Uses `categoryname`.

`\Topological` Category of Hausdorff topological spaces `\Topological`: Top
Uses `categoryname`.

`\Sheaves` Category of sheaves over a space `\Sheaves(M)`: $\mathsf{Sheaves}(M)$
Uses `categoryname`.

`\PreSheaves` Category of presheaves over a space `\PreSheaves(M)`: PreSheaves(M)
Uses `categoryname`.

`\Etale` Category of étalé spaces over a space `\Etale(M)`: Etale(M)
Uses `categoryname`.

4 Known Bugs and Conflicts

There are several conflicts possible since `nchairx` loads a number of other packages, some with explicit options needed to obtain the aspired functionality. In this case, it can not be avoided that the packages is loaded via `nchairx`.

- The package `xkeyval` is loaded without options. This is necessary for many reasons like internal processing of ifs etc.
- The package `amsmath` and `amssymb` are loaded. This can sometimes yield unexpected conflicts with packages overwriting commands from these two packages.
- We define a smiley symbol from the `wasysym` font. This gives a conflict with the `wasysym` package.
- We load the `tensor` package and overwrite the `\tensor` command of that package. The original macro is available under `\originaltensor` and as identical macro `\decorate`.
- We load `ntheorem` with specified options. This is unavoidable to have the correct behaviour of our environments.
- The theorem lists from the `ntheorem` package seem to crash with the `babel` names we use for the actual environments. A workaround for this is e.g.

  ```
  \makeatletter \listtheorems{definitions} \makeatother
  ```

  to get the list of definitions.

5 Implementation

5.1 Processing the Options

Before including other packages we make sure that we can use key-value pairs as options using `xkeyval`

```
1 \RequirePackage{xkeyval}
```

Before including other required packages we have to process the options that might alter the options given to these packages.
First we create ifs for later use.

```
2 \newif\if@loadmath \@loadmathtrue
```

Define option for excluding math macros

```
\DeclareOptionX[chairx]<math>{noMath}{
\@loadmathfalse
}
```

Process options for the style file

```
\ProcessOptionsX[chairx]<math>
```

5.2 Required Packages

After processing the options we can now load the other required packages. The following packages are required for the correct usage of `nchairx`. We include them with some mandatory options.
We will need several things from `amsmath` and `amssymb`.

```
\RequirePackage{amsmath}
\RequirePackage{amssymb}
```

The `suffix` package allows to define $*$-versions of macros.

```
\RequirePackage{suffix}
```

The `mathtools` package provides so many nice things to type-set math. Always a good idea to include this. In particular, we will need the `\DeclarePairedDelimiter` command a lot.

```
\RequirePackage{mathtools}
```

The `ntheorem` package is used to define math environments of various type. We need this package with particular options to make the proof environment work correctly. Note that the proof environment of `ntheorem` places the end-of-proof in a much better way than every other available option.

```
\RequirePackage[amsmath,thmmarks,hyperref]{ntheorem}
```

The `graphicx` package is useful for many things. We need it for our logo support to include pdf-files

```
\RequirePackage{graphicx}
```

The `enumitem` package is now used to generate the enumerated lists of items for the math environments. This allows various fine-tuning and additional functionality for referring to items in lists.

```
\RequirePackage{enumitem}
```

The `tensor` package is used to place symbols at all possible positions around one central symbol

```
\RequirePackage{tensor}
```

Some additional fonts and symbols from `stmaryrd`: we only load the font and grab those symbols we actually need to keep things easy.

```
\DeclareSymbolFont{stmry}{U}{stmry}{m}{n}
\SetSymbolFont{stmry}{bold}{U}{stmry}{b}{n}
```

Last we need `aliascnt` to allow the usage of `\autoref`.

```
\RequirePackage{aliascnt}
```

5.3 The Handling of the Fonts

First we check of macros should be included:

```
\if@loadmath
```

We provide several font names for easier usage and customization. The fonts are used in our macro definitions and can be changed by according to the individual needs.

5.3.1 Default Values for some Math Fonts

`\mathbb` Redefine `\mathbb` to use the nicer `\mathbbm`.

```
\DeclareMathAlphabet{\ch@airxmathbbm}{U}{bbm}{m}{n}
\SetMathAlphabet\ch@airxmathbbm{bold}{U}{bbm}{bx}{n}
\renewcommand{\mathbb}[1]{\ch@airxmathbbm{#1}}
```

`\mathscr` We load a script font and provide the command `\mathscr`

```
\DeclareMathAlphabet{\mathscr}{U}{rsfso}{m}{n}
```

`\mathcal` We redefine the `\mathcal` command using the Euler font.

```
\DeclareSymbolFont{EulerScript}{U}{eus}{m}{n}
\SetSymbolFont{EulerScript}{bold}{U}{eus}{b}{n}
\DeclareSymbolFontAlphabet\mathcal{EulerScript}
```

5.3.2 Setting Fonts for Various Math Groups

Definitions of fonts for the different groups.

`\ch@irxalgebrafont`
`\ch@irxbasisfont`
`\ch@irxcategoryfont`
`\ch@irxcategorynamefont`
`\ch@irxfieldfont`
`\ch@irxfilterfont`
`\ch@irxfunctorfont`
`\ch@irxgerstenhaberfont`
`\ch@irxgroupfont`
`\ch@irxgroupoidfont`
`\ch@irxhilbertfont`
`\ch@irxliealgfont`
`\ch@irxmodulefont`
`\ch@irxprehilbfont`
`\ch@irxoperatorfont`
`\ch@irxringfont`
`\ch@irxscriptfont`
`\ch@irxsheaffont`
`\ch@irxspacesfont`
`\ch@irxtopologyfont`

We use `xkeyval` to define keys setting the different font groups. These keys can be used for the macro `\chairxfonts`. We use `\providecommand` to create the font macros if they do not already exist.

```
\define@key[chairx]{fonts}{algebrafont}{
    \providecommand{\ch@irxalgebrafont}[1]{ }
    \renewcommand{\ch@irxalgebrafont}{#1}
}
\define@key[chairx]{fonts}{basisfont}{
\providecommand{\ch@irxbasisfont}[1]{ }
\renewcommand{\ch@irxbasisfont}{#1}
}
\define@key[chairx]{fonts}{categoryfont}{
    \providecommand{\ch@irxcategoryfont}[1]{ }
    \renewcommand{\ch@irxcategoryfont}{#1}
}
\define@key[chairx]{fonts}{categorynamefont}{
    \providecommand{\ch@irxcategorynamefont}[1]{ }
    \renewcommand{\ch@irxcategorynamefont}{#1}
}
\define@key[chairx]{fonts}{fieldfont}{
\providecommand{\ch@irxfieldfont}[1]{ }
```

```
\renewcommand{\ch@irxfieldfont}{#1}
}
\define@key[chairx]{fonts}{filterfont}{
\providecommand{\ch@irxfilterfont}[1]{ }
\renewcommand{\ch@irxfilterfont}{#1}
}
\define@key[chairx]{fonts}{functorfont}{
\providecommand{\ch@irxfunctorfont}[1]{ }
\renewcommand{\ch@irxfunctorfont}{#1}
}
\define@key[chairx]{fonts}{gerstenhaberfont}{
\providecommand{\ch@irxgerstenhaberfont}[1]{ }
\renewcommand{\ch@irxgerstenhaberfont}{#1}
}
\define@key[chairx]{fonts}{groupfont}{
\providecommand{\ch@irxgroupfont}[1]{ }
\renewcommand{\ch@irxgroupfont}{#1}
}
\define@key[chairx]{fonts}{groupoidfont}{
\providecommand{\ch@irxgroupoidfont}[1]{ }
\renewcommand{\ch@irxgroupoidfont}{#1}
}
\define@key[chairx]{fonts}{hilbertfont}{
\providecommand{\ch@irxhilbertfont}[1]{ }
\renewcommand{\ch@irxhilbertfont}{#1}
}
\define@key[chairx]{fonts}{liealgfont}{
\providecommand{\ch@irxliealgfont}[1]{ }
\renewcommand{\ch@irxliealgfont}{#1}
}
\define@key[chairx]{fonts}{modulefont}{
\providecommand{\ch@irxmodulefont}[1]{ }
\renewcommand{\ch@irxmodulefont}{#1}
}
\define@key[chairx]{fonts}{prehilbfont}{
\providecommand{\ch@irxprehilbfont}[1]{ }
\renewcommand{\ch@irxprehilbfont}{#1}
}
```

Here we need to change the default operatorfont in order to get the chairxoperatorfont also for `\operatorname` and `\DeclareMathOperator`. Note that redefining `\operator@font` with a symbol alphabet and not a symbol font forces us to use an additional bracket in all definitions using `\operatorname` and `\DeclareMathOperator`.

```
\define@key[chairx]{fonts}{operatorfont}{
    \providecommand{\ch@irxoperatorfont}[1]{ }
    \renewcommand{\ch@irxoperatorfont}{#1}
}
\define@key[chairx]{fonts}{ringfont}{
\providecommand{\ch@irxringfont}[1]{ }
```

```
\renewcommand{\ch@irxringfont}{#1}
}
\define@key[chairx]{fonts}{scriptfont}{
    \providecommand{\ch@irxscriptfont}[1]{ }
    \renewcommand{\ch@irxscriptfont}{#1}
}
\define@key[chairx]{fonts}{sheaffont}{
\providecommand{\ch@irxsheaffont}[1]{ }
\renewcommand{\ch@irxsheaffont}{#1}
}
\define@key[chairx]{fonts}{spacefont}{
    \providecommand{\ch@irxspacefont}[1]{ }
    \renewcommand{\ch@irxspacefont}{#1}
}
\define@key[chairx]{fonts}{topologyfont}{
\providecommand{\ch@irxtopologyfont}[1]{ }
\renewcommand{\ch@irxtopologyfont}{#1}
}
```

`\chairxfonts` Command for setting the fonts.

```
\newcommand{\chairxfonts}[1]{
  \setkeys[chairx]{fonts}{#1}
}
```

We use the following default settings for fonts.

```
\chairxfonts{
    algebrafont = \mathscr,
    basisfont = \mathit,
    categoryfont = \mathfrak,
    categorynamefont = \mathsf,
    fieldfont = \mathbb,
    filterfont = \mathfrak,
    functorfont = \mathsf,
    groupfont = \mathrm,
    groupoidfont = \mathfrak,
    gerstenhaberfont = \mathfrak,
    hilbertfont = \mathfrak,
    liealgfont = \mathfrak,
    modulefont = \mathscr,
    prehilbfont = \mathcal,
    operatorfont = \mathrm,
    ringfont = \mathsf,
    scriptfont = \mathrm,
    sheaffont = \mathscr,
    spacefont = \mathscr,
    topologyfont = \mathscr
}
```

code for grabbing a single glyph from some random font without investing a new math alphabet: use only the wrapper macro as `\ch@irxmathsymbol[mathtype]{fontname}{glyph}`

with `mathtype` being the optional type of the symbol with default being`\mathord`, `fontname` the name of the font where the symbol is to be found and `glyph` the number of the symbol inside the specified font.

```
\newcommand{\ch@irxfont}[1]{\fontfamily{#1}\fontencoding{U}\fontseries{m}\fontshape{n}\selectfo
\newcommand{\ch@irxsymbol}[2]{{\ch@irxfont{#1}\char#2}}
\newcommand\ch@irxmathsymbol[3][\mathord]{%
  #1{\ch@irxm@thsymbol{#2}{#3}}}
\def\ch@irxm@thsymbol#1#2{\mathchoice
  {\@ch@irxm@thsymbol{#1}{#2}\tf@size}
  {\@ch@irxm@thsymbol{#1}{#2}\tf@size}
  {\@ch@irxm@thsymbol{#1}{#2}\sf@size}
  {\@ch@irxm@thsymbol{#1}{#2}\ssf@size}}
\def\@ch@irxm@thsymbol#1#2#3{\mbox{\fontsize{#3}{#3}\ch@irxsymbol{#1}{#2}}}
%
\fi
```

5.4 Setting some Defaults

Equations with section numbers.

```
\numberwithin{equation}{section}
\renewcommand{\theequation}{\thesection.\arabic{equation}}
```

Page breaks allowed in long formulas by default.

```
\allowdisplaybreaks
```

More space in arrays.

```
\renewcommand{\arraystretch}{1.2}
```

Better spacing with `\left` and `\right` commands. Hack from TeXExchange `https://tex.stackexchange.com/questions/2607/`

```
\let\originalleft\left
\let\originalright\right
\renewcommand{\left}{\mathopen{}\mathclose\bgroup\originalleft}
\renewcommand{\right}{\aftergroup\egroup\originalright}
```

Empty left pages before new chapter. If not explicitly set to empty the headers might be non-empty with empty content pages. This typically looks rather weird. So the easiest way is to make the page completely blank.

```
\renewcommand{\cleardoublepage}{\clearpage\ifodd\c@page\else\vspace*{\fill}\thispagestyle{empty
```

5.5 Environments

```
      \claimch@irxname
 \conjecturech@irxname
 \conventionch@irxname
  \corollarych@irxname
 \definitionch@irxname
    \examplech@irxname
   \exercisech@irxname
       \hintch@irxname
      \lemmach@irxname
\maintheoremch@irxname
   \notationch@irxname
      \proofch@irxname
\propositionch@irxname
   \questionch@irxname
     \remarkch@irxname
```

First we define the names of the environments in English. Currently we support German and English if the `babel` package is loaded, insert more as you like.

```
\newcommand{\claimch@irxname}{Claim}
\newcommand{\conjecturech@irxname}{Conjecture}
\newcommand{\conventionch@irxname}{Convention}
```

```
\newcommand{\corollarych@irxname}{Corollary}
\newcommand{\definitionch@irxname}{Definition}
\newcommand{\examplech@irxname}{Example}
\newcommand{\exercisech@irxname}{Exercise}
\newcommand{\hintch@irxname}{Hint}
\newcommand{\lemmach@irxname}{Lemma}
\newcommand{\maintheoremch@irxname}{Main Theorem}
\newcommand{\notationch@irxname}{Notation}
\newcommand{\proofch@irxname}{Proof}
\newcommand{\propositionch@irxname}{Proposition}
\newcommand{\questionch@irxname}{Question}
\newcommand{\remarkch@irxname}{Remark}
\newcommand{\subproofch@irxname}{Proof}
\newcommand{\theoremch@irxname}{Theorem}
```

If the `babel` package is loaded with the option for English we fill them with the correct English words. Note that we also need the `strings` option to make this work. Otherwise we do nothing. Careful: no spaces allowed in the list!

```
\@ifpackagewith{babel}{english,strings}{%
  \StartBabelCommands{english}{extras}
  \SetString{\chapterch@irxname}{Chapter}
  \SetString{\sectionch@irxname}{Section}
  \SetString{\subsectionch@irxname}{Section}
  \SetString{\subsubsectionch@irxname}{Section}
  \SetString{\lemmach@irxname}{Lemma}
  \SetString{\propositionch@irxname}{Proposition}
  \SetString{\theoremch@irxname}{Theorem}
  \SetString{\corollarych@irxname}{Corollary}
  \SetString{\definitionch@irxname}{Definition}
  \SetString{\claimch@irxname}{Claim}
  \SetString{\examplech@irxname}{Example}
  \SetString{\remarkch@irxname}{Remark}
  \SetString{\questionch@irxname}{Question}
  \SetString{\conjecturech@irxname}{Conjecture}
  \SetString{\conventionch@irxname}{Convention}
  \SetString{\exercisech@irxname}{Exercise}
  \SetString{\maintheoremch@irxname}{Main Theorem}
  \SetString{\notationch@irxname}{Notation}
  \SetString{\proofch@irxname}{Proof}
  \SetString{\subproofch@irxname}{Proof}
  \SetString{\hintch@irxname}{Hint}
  \EndBabelCommands
}{}
```

Same thing in German.

```
\@ifpackagewith{babel}{german,strings}{%
  \StartBabelCommands{german}{extras}
  \SetString{\chapterch@irxname}{Kapitel}
  \SetString{\sectionch@irxname}{Abschnitt}
```

```
  \SetString{\subsectionch@irxname}{Abschnitt}
  \SetString{\subsubsectionch@irxname}{Abschnitt}
  \SetString{\lemmach@irxname}{Lemma}
  \SetString{\propositionch@irxname}{Proposition}
  \SetString{\theoremch@irxname}{Satz}
  \SetString{\corollarych@irxname}{Korollar}
  \SetString{\definitionch@irxname}{Definition}
  \SetString{\claimch@irxname}{Behauptung}
  \SetString{\examplech@irxname}{Beispiel}
  \SetString{\remarkch@irxname}{Bemerkung}
  \SetString{\questionch@irxname}{Frage}
  \SetString{\conjecturech@irxname}{Vermutung}
  \SetString{\conventionch@irxname}{Konvention}
  \SetString{\exercisech@irxname}{\"Ubung}
  \SetString{\maintheoremch@irxname}{Theorem}
  \SetString{\notationch@irxname}{Notation}
  \SetString{\proofch@irxname}{Beweis}
  \SetString{\subproofch@irxname}{Beweis}
  \SetString{\hintch@irxname}{Hinweis}
  \EndBabelCommands
}{}
```

Now we define the actual environments. We start with header in bold and body in italic.

```
\theoremheaderfont{\normalfont\bfseries}
\theorembodyfont{\itshape}
```

claim
conjecture
corollary
definition
lemma
proposition
theorem

Now those environments with this styling, all share the common numbering scheme. In order to make `\autoref` work properly we need to define alias counter. For each environment we also define `\*autorefname`.

```
\newtheorem{claim}{\claimch@irxname}[section]
\newtheorem*{nnclaim}{\claimch@irxname}
\newaliascnt{conjecture}{claim}
\newtheorem{conjecture}[conjecture]{\conjecturech@irxname}
\newtheorem*{nnconjecture}{\conjecturech@irxname}
\aliascntresetthe{conjecture}
\newaliascnt{corollary}{claim}
\newtheorem{corollary}[corollary]{\corollarych@irxname}
\newtheorem*{nncorollary}{\corollarych@irxname}
\aliascntresetthe{corollary}
\newaliascnt{definition}{claim}
\newtheorem{definition}[definition]{\definitionch@irxname}
\newtheorem*{nndefinition}{\definitionch@irxname}
\aliascntresetthe{definition}
\newaliascnt{lemma}{claim}
\newtheorem{lemma}[lemma]{\lemmach@irxname}
\newtheorem*{nnlemma}{\lemmach@irxname}
\aliascntresetthe{lemma}
\newaliascnt{proposition}{claim}
```

```
\newtheorem{proposition}[proposition]{\propositionch@irxname}
\newtheorem*{nnproposition}{\propositionch@irxname}
\aliascntresetthe{proposition}
\newaliascnt{theorem}{claim}
\newtheorem{theorem}[theorem]{\theoremch@irxname}
\newtheorem*{nntheorem}{\theoremch@irxname}
\aliascntresetthe{theorem}
```

Next we set the body font to roman.

```
\theorembodyfont{\rmfamily}
```

example
convention
notation
question
remark

And have some more environments, still numbered with the same counter.

```
\newaliascnt{example}{claim}
\newtheorem{example}[example]{\examplech@irxname}
\newtheorem*{nnexample}{\examplech@irxname}
\aliascntresetthe{example}
\newaliascnt{convention}{claim}
\newtheorem{convention}[convention]{\conventionch@irxname}
\newtheorem*{nnconvention}{\conventionch@irxname}
\aliascntresetthe{convention}
\newaliascnt{notation}{claim}
\newtheorem{notation}[notation]{\notationch@irxname}
\newtheorem*{nnnotation}{\notationch@irxname}
\aliascntresetthe{notation}
\newaliascnt{question}{claim}
\newtheorem{question}[question]{\questionch@irxname}
\newtheorem*{nnquestion}{\questionch@irxname}
\aliascntresetthe{question}
\newaliascnt{remark}{claim}
\newtheorem{remark}[remark]{\remarkch@irxname}
\newtheorem*{nnremark}{\remarkch@irxname}
\aliascntresetthe{remark}
```

exercise

The exercise environment has a separate counter.

```
\newtheorem{exercise}{\exercisech@irxname}[section]
\newtheorem*{nnexercise}{\exercisech@irxname}
```

maintheorem

We change now for the main theorem styling

```
\theorembodyfont{\itshape}
\theoremnumbering{Roman}
\newtheorem{maintheorem}{\maintheoremch@irxname}
\newtheorem*{nnmaintheorem}{\maintheoremch@irxname}
```

proof
subproof

The proof environments. We use the boxempty symbol from the AMSa font.

```
\DeclareMathSymbol\ch@irxboxempty{\mathord}{AMSa}{"03}
\theoremheaderfont{\scshape}
\theorembodyfont{\normalfont}
\theoremstyle{nonumberplain}
```

```
\theoremseparator{:}
\theoremsymbol{\hbox{$\ch@irxboxempty$}}
\newtheorem{proof}{\proofch@irxname}
\theoremsymbol{\hbox{$\triangledown$}}
\newtheorem{subproof}{\proofch@irxname}
```

hint The hint environment, without numbers and very small.

```
\newenvironment{hint}{\par\footnotesize\medskip\noindent\hintch@irxname: }{\par\smallskip\norma
```

In the theorem titles only the ordinary text in boldface, not the math formulas. Nice hack from David Carlisle via tex.stackexchange

```
\def\theorem@checkbold{}
```

To make these new environments compatible with the `\autoref` macro of the `hyperref`-package, we need the following `\*autorefname` commands.

```
\providecommand{\claimautorefname}{\claimch@irxname}
\providecommand{\conjectureautorefname}{\conjecturech@irxname}
\providecommand{\conventionautorefname}{\conventionch@irxname}
\providecommand{\corollaryautorefname}{\corollarych@irxname}
\providecommand{\definitionautorefname}{\definitionch@irxname}
\providecommand{\lemmaautorefname}{\lemmach@irxname}
\providecommand{\propositionautorefname}{\propositionch@irxname}
\providecommand{\exampleautorefname}{\examplech@irxname}
\providecommand{\notationautorefname}{\notationch@irxname}
\providecommand{\questionautorefname}{\questionch@irxname}
\providecommand{\remarkautorefname}{\remarkch@irxname}
\providecommand{\exerciseautorefname}{\exercisech@irxname}
\providecommand{\thmautorefname}{\theoremch@irxname}
\providecommand{\maintheoremautorefname}{\maintheoremch@irxname}
```

To redefine `\*autorefname` commands which are predefined in `hyperref`, we need a little hack: to allow that `hyperref` is loaded after `nchairx` we put these commands at the beginning of the document part.

```
\AtBeginDocument{
```

Now we fill the `\*autorefname` macros with the language specific names, in order to guarantee compatibility with `babel`. First in english

```
\@ifpackagewith{babel}{english,strings}{%
\StartBabelCommands{english}{extras}
\SetString{\chapterautorefname}{\chapterch@irxname}
\SetString{\sectionautorefname}{\sectionch@irxname}
\SetString{\subsectionautorefname}{\subsectionch@irxname}
\SetString{\subsubsectionautorefname}{\subsubsectionch@irxname}
\SetString{\theoremautorefname}{\theoremch@irxname}
\EndBabelCommands
}{}
```

then in german

```
\@ifpackagewith{babel}{german,strings}{%
\StartBabelCommands{german}{extras}
```

```
\SetString{\chapterautorefname}{\chapterch@irxname}
\SetString{\sectionautorefname}{\sectionch@irxname}
\SetString{\subsectionautorefname}{\subsectionch@irxname}
\SetString{\subsubsectionautorefname}{\subsubsectionch@irxname}
\SetString{\theoremautorefname}{\theoremch@irxname}
\EndBabelCommands
}{}
```

Close the `\AtBeginDocument` command.

```
}
```

`claimlist` `conjecturelist` `conventionlist` `corollarylist` `definitionlist` `lemmalist` `propositionlist` `theoremlist` `prooflist`

Next, we define list environments for all the above types of math environments. They are build using the `enumitem` package and use a rather compact appearance. Each math environment has its own list, though all of them are equal at the moment.

```
\newenvironment{claimlist}[1][]{%
  \enumerate[%
      topsep = 0.2em,
      partopsep = 0em,
      itemsep = 0.2em,
      parsep = 0.1em,
      label=\textit{\roman*.)},
      #1%
      ]%
    }%
    {\endenumerate}
\newenvironment{conjecturelist}[1][]{%
  \enumerate[%
      topsep = 0.2em,
      partopsep = 0em,
      itemsep = 0.2em,
      parsep = 0.1em,
      label=\textit{\roman*.)},
      #1%
      ]%
    }%
    {\endenumerate}
\newenvironment{conventionlist}[1][]{%
\enumerate[%
topsep = 0.2em,
partopsep = 0em,
itemsep = 0.2em,
parsep = 0.1em,
label=\textit{\roman*.)},
#1%
]%
}%
{\endenumerate}
\newenvironment{corollarylist}[1][]{%
  \enumerate[%
```

```
      topsep = 0.2em,
      partopsep = 0em,
      itemsep = 0.2em,
      parsep = 0.1em,
      label=\textit{\roman*.)},
      #1%
      ]
    }%
    {\endenumerate}
\newenvironment{definitionlist}[1][]{%
  \enumerate[%
      topsep = 0.2em,
      partopsep = 0em,
      itemsep = 0.2em,
      parsep = 0.1em,
      label=\textit{\roman*.)},
      #1%
      ]
    }%
    {\endenumerate}
\newenvironment{lemmalist}[1][]{%
  \enumerate[%
      topsep = 0.2em,
      partopsep = 0em,
      itemsep = 0.2em,
      parsep = 0.1em,
      label=\textit{\roman*.)},
      #1%
      ]
    }%
    {\endenumerate}
\newenvironment{propositionlist}[1][]{%
  \enumerate[%
      topsep = 0.2em,
      partopsep = 0em,
      itemsep = 0.2em,
      parsep = 0.1em,
      label=\textit{\roman*.)},
      #1%
      ]
    }%
    {\endenumerate}
\newenvironment{theoremlist}[1][]{%
  \enumerate[%
      topsep = 0.2em,
      partopsep = 0em,
      itemsep = 0.2em,
      parsep = 0.1em,
      label=\textit{\roman*.)},
      #1%
```

```
      ]
    }%
    {\endenumerate}
\newenvironment{prooflist}[1][]{%
\enumerate[%
topsep = 0.2em,
partopsep = 0em,
itemsep = 0.2em,
parsep = 0.1em,
label=\textit{\roman*.)},
#1%
]
}%
{\endenumerate}
```

examplelist
notationlist
questionlist
remarklist

Also for the following environments we have lists:

```
\newenvironment{examplelist}[1][]{%
  \enumerate[%
      topsep = 0.2em,
      partopsep = 0em,
      itemsep = 0.2em,
      parsep = 0.1em,
      label=\textit{\roman*.)},
      #1%
      ]%
    }%
    {\endenumerate}
\newenvironment{notationlist}[1][]{%
  \enumerate[%
      topsep = 0.2em,
      partopsep = 0em,
      itemsep = 0.2em,
      parsep = 0.1em,
      label=\textit{\roman*.)},
      #1%
      ]%
    }%
    {\enumerate}
\newenvironment{questionlist}[1][]{%
  \enumerate[%
      topsep = 0.2em,
      partopsep = 0em,
      itemsep = 0.2em,
      parsep = 0.1em,
      label=\textit{\roman*.)},
      #1%
      ]%
    }%
    {\endenumerate}
\newenvironment{remarklist}[1][]{%
```

```
  \enumerate[%
      topsep = 0.2em,
      partopsep = 0em,
      itemsep = 0.2em,
      parsep = 0.1em,
      label=\textit{\roman*.)},
      #1%
      ]%
    }%
    {\endenumerate}
```

`exerciselist` For the exercises we also need a separate list.

```
\newenvironment{exerciselist}[1][]{%
  \enumerate[%
      topsep = 0.2em,
      partopsep = 0em,
      itemsep = 0.2em,
      parsep = 0.1em,
      label=\textit{\roman*.)},
      #1%
    ]%
  }%
  {\endenumerate}
```

`maintheoremlist` And the main theorem might also consist of several parts which we want to number.

```
\newenvironment{maintheoremlist}[1][]{%
  \enumerate[%
      topsep = 0.2em,
      partopsep = 0em,
      itemsep = 0.2em,
      parsep = 0.1em,
      label=\textit{\roman*.)},
      #1%
      ]%
    }%
    {\endenumerate}
```

We also provide compact versions of the lists in general (similar to the `paralist` package)

`cptenum`

```
\newenvironment{cptenum}[1][]{%
  \enumerate[%
      topsep = 0.2em,
      partopsep = 0em,
      itemsep = 0.2em,
      parsep = 0.1em,
      label=\textit{\roman*.)},
      #1%
```

```
      ]
    }%
    {\endenumerate}
```

cptitem

```
\newenvironment{cptitem}[1][]{%
  \begin{itemize}[%
      topsep = 0.2em,
      partopsep = 0em,
      itemsep = 0.2em,
      parsep = 0.1em,
      #1%
      ]
    }%
    {\end{itemize}}
```

cptdesc

```
\newenvironment{cptdesc}[1][]{%
  \begin{description}[%
      topsep = 0.2em,
      partopsep = 0em,
      itemsep = 0.2em,
      parsep = 0.1em,
      #1%
      ]
    }%
    {\end{description}}
```

5.6 Logo Support

The header logo with textwidth

\nchairxheader

```
\newcommand{\nchairxheader}{\includegraphics[width=\textwidth]{nchairxheader.pdf}}
```

The logo with variable width

\nchairxlogo

```
\newcommand{\nchairxlogo}[1]{\includegraphics[width=#1]{nchairxlogo.pdf}}
```

5.7 The Math Macros

Include the math macros in alphabetical order of the file names.
First we check of macros should be included:

```
\if@loadmath
```

5.7.1 The New Delimiters

\vast \Vast \vastl \vastm \vastr \Vastl \Vastm \Vastr

Bigger than \Bigg commands for explicit re-sizing brackets and things needs left/right version to work with \DeclarePairedDelimiters. Hack from http://tex.stackexchange.com/que

```
\newcommand{\vast}{\bBigg@{4}}
\newcommand{\Vast}{\bBigg@{5}}
\newcommand{\vastl}{\mathopen\vast}
\newcommand{\vastm}{\mathrel\vast}
\newcommand{\vastr}{\mathclose\vast}
\newcommand{\Vastl}{\mathopen\Vast}
\newcommand{\Vastm}{\mathrel\Vast}
\newcommand{\Vastr}{\mathclose\Vast}

\fi
```

First we check of macros should be included:

```
\if@loadmath
```

5.7.2 Decoration

\decorate

We use the tensor package of Philip G. Ratcliffe 2004/12/20 v2.1 tensor indices package (PGR) but overwrite the \tensor command as this collides with our own version. Instead we provide the \decorate macro which is identical to \tensor of the tensor package.

```
\let\originaltensor\tensor
\DeclareRobustCommand\decorate{\originaltensor}
```

\deco

This is a simplified version of \decorate allowing only five positions to be filled.

```
\newcommand{\deco}[5]{\decorate*[^{#1}_{#2}]{#3}{^{#4}_{#5}}}
```

\script

Macro to access the scriptfont.

```
\newcommand{\script}[1]{\ch@irxscriptfont{#1}}

\fi
```

First we check of macros should be included:

```
\if@loadmath
```

5.7.3 General Math Commands

\I

```
\newcommand{\I}{\mathrm{i}}
```

\E

```
\newcommand{\E}{\mathrm{e}}
```

\D

```
\newcommand{\D}{\mathop{}\!\mathrm{d}}
```

```
      \cc
537 \newcommand{\cc}[1]{\overline{{#1}}}
     \sign
538 \newcommand{\sign}{\operatorname{\ch@irxoperatorfont{sign}}}
       \RE
539 \newcommand{\RE}{\operatorname{\ch@irxoperatorfont{Re}}}
       \IM
540 \newcommand{\IM}{\operatorname{\ch@irxoperatorfont{Im}}}
     \Unit
541 \newcommand{\Unit}{\mathbb{1}}
    \const
542 \newcommand{\const}{\operatorname{\mathit{const}}}
\canonical
543 \newcommand{\canonical}{\ch@irxscriptfont{can}}
       \pt
544 \newcommand{\pt}{\ch@irxoperatorfont{pt}}
```

5.7.4 Restrictions

```
       \at
545 \newcommand{\at}[2][\big]{#1\vert_{#2}}
```

5.7.5 Maps and Related Stuff

```
      \Map
546 \newcommand{\Map}{\ch@irxoperatorfont{Map}}
      \Bij
547 \newcommand{\Bij}{\ch@irxoperatorfont{Bij}}
 \argument
548 \newcommand{\argument}{\,\cdot\,}
   \domain
549 \newcommand{\domain}{\operatorname{\ch@irxoperatorfont{dom}}}
    \range
550 \newcommand{\range}{\operatorname{\ch@irxoperatorfont{range}}}
       \id
551 \newcommand{\id}{\operatorname{\ch@irxoperatorfont{id}}}
```

\pr
```
\newcommand{\pr}{\operatorname{\ch@irxoperatorfont{pr}}}
```
\inv
```
\newcommand{\inv}{\operatorname{\ch@irxoperatorfont{inv}}}
```
\ev
```
\newcommand{\ev}{\operatorname{\ch@irxoperatorfont{ev}}}
```
\image
```
\newcommand{\image}{\operatorname{\ch@irxoperatorfont{im}}}
```
\graph
```
\newcommand{\graph}{\operatorname{\ch@irxoperatorfont{graph}}}
```
\coimage
```
\newcommand{\coimage}{\operatorname{\ch@irxoperatorfont{coim}}}
```
\coker
```
\newcommand{\coker}{\operatorname{\ch@irxoperatorfont{coker}}}
```
\operator
```
\newcommand{\operator}[1]{\operatorname{\ch@irxoperatorfont{#1}}}
```

5.7.6 Relations

\later
```
\newcommand{\later}{\mathrel{\succcurlyeq}}
```
\earlier
```
\newcommand{\earlier}{\mathrel{\preccurlyeq}}
```

5.7.7 Sums and Products

\bigop To define sum-like operators that are scaled up in displaystyle we define the following command taken from tex.stackexchange.com/questions/23432/how-to-create-my-own-math-operator-with-limits

```
\DeclareRobustCommand\big@p[2][1]{%
\mathop{\vphantom{\sum}\mathpalette\bigop@{{#1}{#2}}}\slimits@
}
\newcommand{\bigop@}[2]{\bigop@@#1#2}
\newcommand{\bigop@@}[3]{%
\vcenter{
\sbox\z@{$#1\sum$}
\hbox{\resizebox{\ifx#1\displaystyle#2\fi\dimexpr\ht\z@+\dp\z@}{!}{$\m@th#3$}}
}
}
```

\bigplus The command \DOTSB is used for correct behaviour of \dots before or after the command.

```
\newcommand{\bigplus}{\DOTSB\big@p{+}}
```

\bigtimes

```
\newcommand{\bigtimes}{\DOTSB\big@p{\times}}
```

\biprod

```
\newcommand{\biprod}{\DOTSB\big@p{\mathrel{\prod\hspace{-0.4cm}\coprod}}}
```

5.7.8 Labels

Smiley from wasysym

\smiley

```
\newcommand{\smiley}{\ch@irxmathsymbol[\mathord]{wasy}{44}}
```

Frownie from wasysym

\frownie

```
\newcommand{\frownie}{\ch@irxmathsymbol[\mathord]{wasy}{47}}
```

\heart

```
\newcommand{\heart}{\heartsuit}
```

```
\fi
```

First we check of macros should be included:

```
\if@loadmath
```

5.7.9 Fonts for Rings and Things

\field

```
\newcommand{\field}[1]{\ch@irxfieldfont{#1}}
```

\ring

```
\newcommand{\ring}[1]{\ch@irxringfont{#1}}
```

\group

```
\newcommand{\group}[1]{\ch@irxgroupfont{#1}}
```

\algebra

```
\newcommand{\algebra}[1]{\ch@irxalgebrafont{#1}}
```

\module

```
\newcommand{\module}[1]{\ch@irxmodulefont{#1}}
```

\liealg

```
\newcommand{\liealg}[1]{\ch@irxliealgfont{#1}}
```

\MC
```
586 \newcommand{\MC}{{\scriptscriptstyle\ch@irxscriptfont{MC}}}
```
\gerstenhaber
```
587 \newcommand{\gerstenhaber}[1] {\ch@irxgerstenhaberfont{#1}}
```

5.7.10 Some Symbols needed in Algebra

\Pol
```
588 \newcommand{\Pol}{\ch@irxoperatorfont{Pol}}
```
\lmult
```
589 \newcommand{\lmult}{\operatorname{\ch@irxoperatorfont{\ell}}}
```
\rmult
```
590 \newcommand{\rmult}{\operatorname{\ch@irxoperatorfont{r}}}
```
\Lmult
```
591 \newcommand{\Lmult}{\operatorname{\ch@irxoperatorfont{L}}}
```
\Rmult
```
592 \newcommand{\Rmult}{\operatorname{\ch@irxoperatorfont{R}}}
```
\Center Needs `mathrsfs` package.
```
593 \newcommand{\Center}{\mathscr{Z}}
```
\ad
```
594 \newcommand{\ad}{\operatorname{\ch@irxoperatorfont{ad}}}
```
\Ad
```
595 \newcommand{\Ad}{\operatorname{\ch@irxoperatorfont{Ad}}}
```
\Conj
```
596 \newcommand{\Conj}{\operatorname{\ch@irxoperatorfont{Conj}}}
```
\acts
```
597 \newcommand{\acts}{\mathbin{\triangleright}}
```
\racts
```
598 \newcommand{\racts}{\mathbin{\triangleleft}}
```
\Char
```
599 \newcommand{\Char}{\ch@irxoperatorfont{char}}
```
\modulo
```
600 \newcommand{\modulo}{\operatorname{\ch@irxoperatorfont{mod}}}
```

```
\Clifford
601 \newcommand{\Clifford}{\operatorname{\ch@irxoperatorfont{Cl}}}

\cClifford
602 \newcommand{\cClifford}{\operatorname{\mathbb{C}\ch@irxoperatorfont{l}}}

    \Der
603 \newcommand{\Der}{\operatorname{\ch@irxoperatorfont{Der}}}
604 \WithSuffix\newcommand\Der*{\decorate[^*]{\textrm{-}\Der}{}}

 \InnDer
605 \newcommand{\InnDer}{\operatorname{\ch@irxoperatorfont{InnDer}}}
606 \WithSuffix\newcommand\InnDer*{\decorate[^*]{\textrm{-}\InnDer}{}}

 \OutDer
607 \newcommand{\OutDer}{\operatorname{\ch@irxoperatorfont{OutDer}}}
608 \WithSuffix\newcommand\OutDer*{\decorate[^*]{\textrm{-}\OutDer}{}}

 \InnAut
609 \newcommand{\InnAut}{\operatorname{\ch@irxoperatorfont{InnAut}}}
610 \WithSuffix\newcommand\InnAut*{\decorate[^*]{\textrm{-}\InnAut}{}}

 \OutAut
611 \newcommand{\OutAut}{\operatorname{\ch@irxoperatorfont{OutAut}}}
612 \WithSuffix\newcommand\OutAut*{\decorate[^*]{\textrm{-}\OutAut}{}}

 \formal
613 \newcommand{\formal}[1]{\ch@irxllbbracket #1\ch@irxrrbbracket}

\laurent
614 \newcommand{\laurent}[1]{(\!(#1)\!)}

\sweedler
615 \newcommand{\sweedler}[1]{{\scriptscriptstyle(#1)}}
```

5.7.11 Categories from Algebra

```
\algebras
616 \newcommand{\algebras}{\categoryname{alg}}
617 \WithSuffix\newcommand\algebras*{\decorate[^*]{\textrm{-}\algebras}{}}

\Algebras
618 \newcommand{\Algebras}{\categoryname{Alg}}
619 \WithSuffix\newcommand\Algebras*{\decorate[^*]{\textrm{-}\Algebras}{}}

   \reps
620 \newcommand{\reps}{\categoryname{rep}}
621 \WithSuffix\newcommand\reps*{\decorate[^*]{\textrm{-}\reps}{}}
```

```
       \Reps
622 \newcommand{\Reps}{\categoryname{Rep}}
623 \WithSuffix\newcommand\Reps*{\decorate[^*]{\textrm{-}\Reps}{}}

  \PoissonAlg
624 \newcommand{\PoissonAlg}{\categoryname{PoissonAlg}}
625 \WithSuffix\newcommand\PoissonAlg*{\decorate[^*]{\textrm{-}\PoissonAlg}{}}

     \modules
626 \newcommand{\modules}{\categoryname{mod}}
627 \WithSuffix\newcommand\modules*{\decorate[^*]{\textrm{-}\modules}{}}

 \Leftmodules
628 \newcommand{\Leftmodules}[1]{{#1}\textsf{-}\categoryname{mod}}

\Rightmodules
629 \newcommand{\Rightmodules}[2][]{\categoryname{mod}_{#1}\textsf{-}{#2}}

     \Modules
630 \newcommand{\Modules}{\categoryname{Mod}}
631 \WithSuffix\newcommand\Modules*{\decorate[^*]{\textrm{-}\Modules}{}}

 \LeftModules
632 \newcommand{\LeftModules}[1]{{#1}\textsf{-}\categoryname{Mod}}

\RightModules
633 \newcommand{\RightModules}[2][]{\categoryname{Mod}_{#1}\textsf{-}{#2}}

   \Bimodules
634 \newcommand{\Bimodules}{\categoryname{Bimod}}
635 \WithSuffix\newcommand\Bimodules*{\decorate[^*]{\textrm{-}\Bimodules}{}}

       \Rings
636 \newcommand{\Rings}{\categoryname{Ring}}

      \Groups
637 \newcommand{\Groups}{\categoryname{Group}}

         \Ab
638 \newcommand{\Ab}{\categoryname{Ab}}

    \Lattices
639 \newcommand{\Lattices}{\categoryname{Lattice}}

        \Sets
640 \newcommand{\Sets}{\categoryname{Set}}
```

```
    \Vect
641 \newcommand{\Vect}{\categoryname{Vect}}
  \LieAlgs
642 \newcommand{\LieAlgs}{\categoryname{LieAlg}}
   \Posets
643 \newcommand{\Posets}{\categoryname{Poset}}
 \Directed
644 \newcommand{\Directed}{\categoryname{Directed}}
    \GSets
645 \newcommand{\GSets}[1][{G}]{{#1}\textrm{-}\Sets}
\Groupoids
646 \newcommand{\Groupoids}{\categoryname{Groupoid}}
647 \fi
```

First we check of macros should be included:

```
648 \if@loadmath
```

5.7.12 General Analysis

```
     \vol
649 \newcommand{\vol}{\ch@irxoperatorfont{vol}}
 \complete
650 \newcommand{\complete}[1]{\widehat{#1}}
    \Ball
651 \newcommand{\Ball}{\ch@irxoperatorfont{B}}
     \abs
652 \DeclarePairedDelimiter{\abs}{\lvert}{\rvert}
    \norm
653 \DeclarePairedDelimiter{\norm}{\lVert}{\rVert}
  \supnorm
654 \newcommand{\@supnormstar}[1]{\norm*{#1}_\infty}
655 \newcommand{\@supnormnostar}[2][]{\norm[#1]{#2}_\infty}
656 \newcommand{\supnorm}{\@ifstar\@supnormstar\@supnormnostar}
  \expands
657 \newcommand{\expands}[1][2.5]{\mathrel{\scalebox{#1}[1.1]{$\sim$}}}
```

5.7.13 Pseudodifferential Operators

\std
```
\newcommand{\std}{{\scriptscriptstyle{\ch@irxscriptfont{std}}}}
```
\Weyl
```
\newcommand{\Weyl}{{\scriptscriptstyle{\ch@irxscriptfont{Weyl}}}}
```
\Op
```
\newcommand{\Op}{\operatorname{Op}}
```
\Opstd
```
\newcommand{\Opstd}{\operatorname{Op}_\std}
```
\OpWeyl
```
\newcommand{\OpWeyl}{\operatorname{Op}_\Weyl}
```

5.7.14 Function Spaces

\spacename
```
\newcommand{\spacename}[1]{\ch@irxspacefont{#1}}
```
\Bounded
```
\newcommand{\Bounded}{\ch@irxspacefont{B}}
```
\Continuous
```
\newcommand{\Continuous}{\ch@irxspacefont{C}}
```
\Contbound
```
\newcommand{\Contbound}{\Continuous_{\mathrm{b}}}
```
\Fun
```
\newcommand{\Fun}[1][k]{\ch@irxspacefont{C}^{#1}}
```
\Cinfty
```
\newcommand{\Cinfty}{\Fun[\infty]}
```
\Comega
```
\newcommand{\Comega}{\Fun[\omega]}
```
\Holomorphic
```
\newcommand{\Holomorphic}{\ch@irxspacefont{O}}
```
\AntiHolomorphic
```
\newcommand{\AntiHolomorphic}{\cc{\Holomorphic}}
```
\Schwartz
```
\newcommand{\Schwartz}{\ch@irxspacefont{S}}
```
\Riemann
```
\newcommand{\Riemann}{\ch@irxspacefont{R}}
```

5.7.15 Locally Convex Spaces

\singsupp
```
\newcommand{\singsupp}{\operatorname{sing\,supp}}
```

\seminorm
```
\newcommand{\seminorm}[1]{\mathrm{#1}}
```

\ord
```
\newcommand{\ord}{\operatorname{ord}}
```

\conv
```
\newcommand{\conv}{\operatorname{conv}}
```

\extreme
```
\newcommand{\extreme}{\operatorname{extreme}}
```

5.7.16 Hilbert Spaces

\hilbert
```
\newcommand{\hilbert}[1]{\ch@irxhilbertfont{#1}}
```

\prehilb
```
\newcommand{\prehilb}[1]{\ch@irxprehilbfont{#1}}
```

\Adjointable
```
\newcommand{\Adjointable}[1][{}]{\mathfrak{B}_{\scriptscriptstyle{#1}}}
```

\Finite
```
\newcommand{\Finite}[1][{}]{\mathfrak{F}_{\scriptscriptstyle{#1}}}
```

\Compact
```
\newcommand{\Compact}[1][{}]{\mathfrak{K}_{\scriptscriptstyle{#1}}}
```

\opdomain
```
\newcommand{\opdomain}{\ch@irxhilbertfont{D}}
```

\spec
```
\newcommand{\spec}{\operatorname{\ch@irxoperatorfont{spec}}}
```

\closure
```
\newcommand{\closure}[1]{\overline{#1}}
```

\res
```
\newcommand{\res}{\operatorname{\ch@irxoperatorfont{res}}}
```

\Res
```
\newcommand{\Res}{\operatorname{\ch@irxoperatorfont{Res}}}
```

```
\specrad
          689 \newcommand{\specrad}{\operatorname{\varrho}}
    \slim
          690 \newcommand{\slim}{\operatorname*{\ch@irxoperatorfont{s-lim}}}
    \wlim
          691 \newcommand{\wlim}{\operatorname*{\ch@irxoperatorfont{w-lim}}}
```

5.7.17 Dirac's bra and ket

```
     \bra
     \ket 692 \DeclarePairedDelimiter{\ketbr@}{\vert}{\vert}
  \braket 693 \DeclarePairedDelimiter{\ket}{\vert}{\rangle}
  \ketbra 694 \DeclarePairedDelimiter{\bra}{\langle}{\vert}
          695 \newcommand{\braket}[3][]{\SP[#1]{#2 \,#1\vert\, #3}}
          696 \newcommand{\ketbra}[3][]{\ketbr@[#1]{#2 #1\rangle #1\langle #3}}
```

5.7.18 Operator Algebras

```
    \Spec
          697 \newcommand{\Spec}{\operatorname{\ch@irxoperatorfont{Spec}}}
     \Rad
          698 \newcommand{\Rad}{\operatorname{\ch@irxoperatorfont{Rad}}}
     \ind
          699 \newcommand{\ind}{\operatorname{\ch@irxoperatorfont{ind}}}
```

5.7.19 Measure Theory and Integration

```
\Measurable
          700 \newcommand{\Measurable}{\ch@irxspacefont{M}}
    \Meas
          701 \newcommand{\Meas}{\ch@irxoperatorfont{Meas}}
\BoundMeas
          702 \newcommand{\BoundMeas}{\ch@irxspacefont{BM}}
      \Lp
          703 \newcommand{\Lp}[1][{p}]{\mathrm{L}^{#1}}
    \Lone
          704 \newcommand{\Lone}{\Lp[1]}
    \Ltwo
          705 \newcommand{\Ltwo}{\Lp[2]}
```

```
\Linfty
706 \newcommand{\Linfty}{\Lp[\infty]}
\Intp
707 \newcommand{\Intp}[1][{p}]{\ch@irxspacefont{L}^{#1}}
\Intone
708 \newcommand{\Intone}{\Intp[1]}
\Inttwo
709 \newcommand{\Inttwo}{\Intp[2]}
\Intinfty
710 \newcommand{\Intinfty}{\Intp[\infty]}
\essrange
711 \newcommand{\essrange}{\operatorname{\ch@irxoperatorfont{ess\,range}}}
\esssup
712 \newcommand*{\esssup}{\operatorname*{\ch@irxoperatorfont{ess}\,\ch@irxoperatorfont{\sup}}}
\esssupnormstar
713 \newcommand{\@esssupnormstar}[1]{\norm*{#1}_{\esssup}}
714 \newcommand{\@esssupnormnostar}[2][]{\norm[#1]{#2}_{\esssup}}
715 \newcommand{\esssupnorm}{\@ifstar\@esssupnormstar\@esssupnormnostar}
\ac
716 \newcommand{\ac}{\ch@irxscriptfont{ac}}
\sing
717 \newcommand{\sing}{\ch@irxscriptfont{sing}}
```

5.7.20 Limits

```
\indlim
718 \newcommand{\indlim}{\operatorname*{{ind\,lim}}}
\projlim
719 \renewcommand{\projlim}{\operatorname*{{proj\,lim}}}
720 \fi
```

First we check of macros should be included:

```
721 \if@loadmath
```

5.7.21 General Category Theory

General stuff for categories.

\category
```
722 \newcommand{\category}[1]{\ch@irxcategoryfont{#1}}
```
\categoryname
```
723 \newcommand{\categoryname}[1]{\ch@irxcategorynamefont{#1}}
```
\functor
```
724 \newcommand{\functor}[1]{\ch@irxfunctorfont{#1}}
```
\groupoid
```
725 \newcommand{\groupoid}[1]{\ch@irxgroupoidfont{#1}}
```
\source
```
726 \newcommand{\source}{\ch@irxoperatorfont{source}}
```
\target
```
727 \newcommand{\target}{\ch@irxoperatorfont{target}}
```
\unit
```
728 \newcommand{\unit}{\ch@irxoperatorfont{unit}}
```
\opp
```
729 \newcommand{\opp}{\ch@irxscriptfont{opp}}
```
\asso
```
730 \newcommand{\asso}{\ch@irxoperatorfont{asso}}
```
\Hom
```
731 \newcommand{\Hom}{\operatorname{\ch@irxoperatorfont{Hom}}}
```
\End
```
732 \newcommand{\End}{\operatorname{\ch@irxoperatorfont{End}}}
```
\Aut
```
733 \newcommand{\Aut}{\operatorname{\ch@irxoperatorfont{Aut}}}
734 \WithSuffix\newcommand\Aut*{\decorate[^*]{\textrm{-}\Aut}{}}
```
\Iso
```
735 \newcommand{\Iso}{\operatorname{\ch@irxoperatorfont{Iso}}}
736 \WithSuffix\newcommand\Iso*{\decorate[^*]{\textrm{-}\Iso}{}}
```
\Obj
```
737 \newcommand{\Obj}{\operatorname{\ch@irxoperatorfont{Obj}}}
```
\Morph
```
738 \newcommand{\Morph}{\operatorname{\ch@irxoperatorfont{Morph}}}
```

5.7.22 Colimits

\colim

```
739 \newcommand{\colim}{\operatorname*{{colim}}}
```

```
740 \fi
```

First we check of macros should be included:

```
741 \if@loadmath
```

5.7.23 General Differential Geometry

\Lie

```
742 \newcommand{\Lie}{\mathscr{L}}
```

A generic bracket as paired delimiter, used in several other macros

\ch@irxbbracket

```
743 \DeclarePairedDelimiter{\ch@irxbracket}{[}{]}
```

A generic double bracket as paired delimiter, used in several other macros

\ch@irxbbracket

```
744 \DeclareMathDelimiter\ch@irxllbbracket{\mathopen}{stmry}{"4A}{stmry}{"71}
745 \DeclareMathDelimiter\ch@irxrrbbracket{\mathclose}{stmry}{"4B}{stmry}{"79}
746 \DeclarePairedDelimiter{\ch@irxbbracket}{\ch@irxllbbracket}{\ch@irxrrbbracket}
```

\Schouten

```
747 \newcommand{\@schoutenstar}[1]{\ch@irxbbracket*{#1}_{\scriptscriptstyle\ch@irxscriptfont{S}}}
748 \newcommand{\@schoutennostar}[2][]{\ch@irxbbracket[#1]{#2}_{\scriptscriptstyle\ch@irxscriptfont
749 \newcommand{\Schouten}{\@ifstar\@schoutenstar\@schoutennostar}
```

\Forms

```
750 \newcommand{\Forms}{\Omega}
```

\ZdR

```
751 \newcommand{\ZdR}{\ch@irxoperatorfont{Z}_{\scriptscriptstyle\mathrm{dR}}}
```

\BdR

```
752 \newcommand{\BdR}{\ch@irxoperatorfont{B}_{\scriptscriptstyle\ch@irxscriptfont{dR}}}
```

\HdR

```
753 \newcommand{\HdR}{\ch@irxoperatorfont{H}_{\scriptscriptstyle\ch@irxscriptfont{dR}}}
```

\Diffeo

```
754 \newcommand{\Diffeo}{\operatorname{\ch@irxoperatorfont{Diffeo}}}
```

\Diffop

```
755 \newcommand{\Diffop}{\operatorname{\ch@irxoperatorfont{DiffOp}}}
```

```
      \loc
```
```
756 \newcommand{\loc}{\ch@irxscriptfont{loc}}
```
```
     \germ
```
```
757 \newcommand{\germ}{\operatorname{\ch@irxoperatorfont{germ}}}
```
```
     \prol
```
```
758 \newcommand{\prol}{\ch@irxoperatorfont{prol}}
```
```
\NRbracket
```
```
759 \newcommand{\@nrbracketstar}[1]{\ch@irxbracket*{#1}_{\scriptscriptstyle\ch@irxscriptfont{NR}}}
760 \newcommand{\@nrbracketnostar}[2][]{\ch@irxbracket[#1]{#2}_{\scriptscriptstyle\ch@irxscriptfont
761 \newcommand{\NRbracket}{\@ifstar\@nrbracketstar\@nrbracketnostar}
```
```
\FNbracket
```
```
762 \newcommand{\@fnbracketstar}[1]{\ch@irxbracket*{#1}_{\scriptscriptstyle\ch@irxscriptfont{FN}}}
763 \newcommand{\@fnbracketnostar}[2][]{\ch@irxbracket[#1]{#2}_{\scriptscriptstyle\ch@irxscriptfont
764 \newcommand{\FNbracket}{\@ifstar\@fnbracketstar\@fnbracketnostar}
```
```
 \Manifold
```
```
765 \newcommand{\Manifolds}{\categoryname{\categoryname{Manifold}}}
```

5.7.24 Lie Groups and Principal Fiber Bundles

```
 \lefttriv
```
```
766 \newcommand{\lefttriv}{\ch@irxoperatorfont{left}}
```
```
\righttriv
```
```
767 \newcommand{\righttriv}{\ch@irxoperatorfont{right}}
```
```
      \Gau
```
```
768 \newcommand{\Gau}{\operatorname{\ch@irxoperatorfont{Gau}}}
```
```
     \Conn
```
```
769 \newcommand{\Conn}{\operatorname{\ch@irxoperatorfont{Conn}}}
```
```
    \ratio
```
```
770 \newcommand{\ratio}{\ch@irxoperatorfont{r}}
```
```
 \Parallel
```
```
771 \newcommand{\Parallel}{\operatorname{\ch@irxoperatorfont{P}}}
```
```
       \CE
```
```
772 \newcommand{\CE}{{\scriptscriptstyle{\ch@irxscriptfont{CE}}}}
```
```
      \HCE
```
```
773 \newcommand{\HCE}{\ch@irxoperatorfont{H}_\CE}
```

```
      \fund
774 \newcommand{\fund}{\ch@irxoperatorfont{fund}}
 \Universal
775 \newcommand{\Universal}{\operatorname{\ch@irxoperatorfont{U}}}
       \BCH
776 \newcommand{\BCH}{\ch@irxscriptfont{\scriptscriptstyle{BCH}}}
 \LieGroups
777 \newcommand{\LieGroups}{\categoryname{\categoryname{LieGroup}}}
 \Principal
778 \newcommand{\Principal}{\categoryname{\categoryname{Principal}}}
\GPrincipal
779 \newcommand{\GPrincipal}[1][G]{#1\categoryname{\textrm{-}\categoryname{Principal}}}
     \Fiber
780 \newcommand{\Fiber}{\categoryname{Fiber}}
    \FFiber
781 \newcommand{\FFiber}[1][F]{#1\categoryname{\textrm{-}\categoryname{Fiber}}}
       \Pin
782 \newcommand{\Pin}{\group{Pin}}
      \Spin
783 \newcommand{\Spin}{\group{Spin}}
```

5.7.25 (Pseudo) Riemannian Geometry

```
   \nablaLC
784 \newcommand{\nablaLC}{\nabla^{\scriptscriptstyle\ch@irxscriptfont{LC}}}
   \Laplace
785 \newcommand{\Laplace}{\Delta}
 \dAlembert
786 \DeclareMathSymbol\dAlembert{\mathord}{AMSa}{"03}
   \feynman
787 \newcommand{\feynman}[1]{\ooalign{$#1$\cr\hidewidth$\raise0.19ex\hbox{/}$\hidewidth\cr}}
     \Dirac
788 \newcommand{\Dirac}{\feynman{D}}
```

```
  \rotation
789 \newcommand{\rotation}{\operatorname{\ch@irxoperatorfont{rot}}}
      \curl
790 \newcommand{\curl}{\operatorname{\ch@irxoperatorfont{curl}}}
\divergence
791 \newcommand{\divergence}{\operatorname{\ch@irxoperatorfont{div}}}
  \gradient
792 \newcommand{\gradient}{\operatorname{\ch@irxoperatorfont{grad}}}
       \Tor
793 \newcommand{\Tor}{\operatorname{\ch@irxoperatorfont{Tor}}}
       \Ric
794 \newcommand{\Ric}{\operatorname{\ch@irxoperatorfont{Ric}}}
      \scal
795 \newcommand{\scal}{\operatorname{\ch@irxoperatorfont{scal}}}
      \Riem
796 \newcommand{\Riem}{\operatorname{\ch@irxoperatorfont{Riem}}}
   \Hessian
797 \newcommand{\Hessian}{\ch@irxoperatorfont{Hessian}}
     \hodge
798 \newcommand{\hodge}{\operatorname{\star}}
```

5.7.26 Complex Geometry

```
 \Nijenhuis
799 \newcommand{\Nijenhuis}{\operatorname{\ch@irxoperatorfont{Nij}}}
       \del
800 \newcommand{\del}{\mathop{}\!\partial}
    \delbar
801 \newcommand{\delbar}{\mathop{}\!\cc{\partial}}
        \FS
802 \newcommand{\FS}{{\scriptscriptstyle{\ch@irxscriptfont{FS}}}}
```

5.7.27 Vector Bundles

\Lift
```
\newcommand{\Lift}{{\scriptscriptstyle{\ch@irxscriptfont{Lift}}}}
```
\ver
```
\newcommand{\ver}{\ch@irxscriptfont{ver}}
```
\hor
```
\newcommand{\hor}{\ch@irxscriptfont{hor}}
```
\Ver
```
\newcommand{\Ver}{\operatorname{\ch@irxoperatorfont{Ver}}}
```
\Hor
```
\newcommand{\Hor}{\operatorname{\ch@irxoperatorfont{Hor}}}
```
\Sec
```
\newcommand{\Sec}[1][k]{\Gamma^{#1}}
```
\Secinfty
```
\newcommand{\Secinfty}{\Sec[\infty]}
```
\HolSec
```
\newcommand{\HolSec}{\Sec[]_{\ch@irxscriptfont{hol}}}
```
\SymD
```
\newcommand{\SymD}{\mathop{}\!\ch@irxoperatorfont{D}}
```
\Densities
```
\newcommand{\Densities}[1][n]{\abs{\Lambda^{#1}}}
```
\MeasurableSections
```
\newcommand{\MeasurableSections}{\ch@irxspacefont{M}\Sec[]}
```
\IntpSections
```
\newcommand{\IntpSections}[1][p]{\Intp[#1]\Sec[]}
```
\IntegrableSections
```
\newcommand{\IntegrableSections}{\IntpSections[1]}
```
\Translation
```
\newcommand{\Translation}{\ch@irxoperatorfont{T}}
```
\frames
```
\newcommand{\frames}[1]{\ch@irxoperatorfont{#1}}
```
\Frames
```
\newcommand{\Frames}{\operatorname{\ch@irxoperatorfont{Frames}}}
```
\FDiff
```
\newcommand{\FDiff}{\ch@irxoperatorfont{F}}
```

5.7.28 Symplectic and Poisson Geometry

\Sympl
```
820 \newcommand{\Sympl}{\operatorname{\ch@irxgroupfont{Sympl}}}
```
\Jacobiator
```
821 \newcommand{\Jacobiator}[1][\pi]{\operatorname{\ch@irxoperatorfont{Jac}}_{#1}}
```
\red
```
822 \newcommand{\red}{\ch@irxscriptfont{red}}
```
\Hess
```
823 \newcommand{\Hess}{\ch@irxoperatorfont{Hess}}
```
\KKS
```
824 \newcommand{\KKS}{{\scriptscriptstyle\ch@irxscriptfont{KKS}}}
```
\Courant
```
825 \newcommand{\@courantstar}[1]{\ch@irxbbracket*{#1}_{\scriptscriptstyle\ch@irxscriptfont{C}}}
826 \newcommand{\@courantnostar}[2][]{\ch@irxbbracket[#1]{#2}_{\scriptscriptstyle\ch@irxscriptfont{
827 \newcommand{\Courant}{\@ifstar\@courantstar\@courantnostar}
```
\Dorfman
```
828 \newcommand{\@dorfmanstar}[1]{\ch@irxbbracket*{#1}_{\scriptscriptstyle\ch@irxscriptfont{D}}}
829 \newcommand{\@dorfmannostar}[2][]{\ch@irxbbracket[#1]{#2}_{\scriptscriptstyle\ch@irxscriptfont{
830 \newcommand{\Dorfman}{\@ifstar\@dorfmanstar\@dorfmannostar}
```
\Dir
```
831 \newcommand{\Dir}{\operatorname{\ch@irxoperatorfont{Dir}}}
```
\Forward
```
832 \newcommand{\Forward}{\mathcal{F}}
```
\Backward
```
833 \newcommand{\Backward}{\mathcal{B}}
```
\Tangent
```
834 \newcommand{\Tangent}{\mathbb{T}}
```
\MWreduction
```
835 \newcommand{\MWreduction}{\big/\!\!\big/}
```
\Mon
```
836 \newcommand{\Mon}{\ch@irxoperatorfont{Mon}}
```
\Hol
```
837 \newcommand{\Hol}{\ch@irxoperatorfont{Hol}}
838 \fi
```
First we check of macros should be included:
```
839 \if@loadmath
```

5.7.29 General Linear Algebra

```
    \tr
840 \newcommand{\tr}{\operatorname{\ch@irxoperatorfont{tr}}}
  \rank
841 \newcommand{\rank}{\operatorname{\ch@irxoperatorfont{rank}}}
 \codim
842 \newcommand{\codim}{\operatorname{\ch@irxoperatorfont{codim}}}
  \diag
843 \newcommand{\diag}{\operatorname{\ch@irxoperatorfont{diag}}}
 \Trans
844 \newcommand{\Trans}{{\ch@irxscriptfont{\scriptscriptstyle{T}}}}
   \Mat
845 \newcommand{\Mat}{\ch@irxoperatorfont{M}}
\SymMat
846 \newcommand{\SymMat}{\ch@irxoperatorfont{SymMat}}
   \ann
847 \newcommand{\ann}{\ch@irxscriptfont{ann}}
  \Span
848 \newcommand{\Span}[1][]{\operatorname{\ch@irxoperatorfont{span}_{#1}}}
 \basis
849 \newcommand{\basis}[1]{\ch@irxbasisfont{#1}}
```

5.7.30 Tensors

```
\tensor
850 \renewcommand{\tensor}[1][{}]{\mathbin{\otimes_{\scriptscriptstyle{#1}}}}
\Tensor
851 \newcommand{\Tensor}{\ch@irxoperatorfont{T}}
  \Anti
852 \newcommand{\Anti}{\Lambda}
   \Sym
853 \newcommand{\Sym}{\ch@irxoperatorfont{S}}
\Symmetrizer
854 \newcommand{\Symmetrizer}{\operatorname{\ch@irxoperatorfont{Sym}}}
```

```
\AntiSymmetrizer
                  855 \newcommand{\AntiSymmetrizer}{\operatorname{\ch@irxoperatorfont{Alt}}}
            \ins
                  856 \newcommand{\ins}{\operatorname{\ch@irxoperatorfont{i}}}
            \jns
                  857 \newcommand{\jns}{\operatorname{\ch@irxoperatorfont{j}}}
           \insa
                  858 \newcommand{\insa}{\ins_{\ch@irxscriptfont{a}}}
           \inss
                  859 \newcommand{\inss}{\ins_{\ch@irxscriptfont{s}}}
           \degs
                  860 \newcommand{\degs}{\ch@irxoperatorfont{deg}_{\ch@irxscriptfont{s}}}
           \dega
                  861 \newcommand{\dega}{\ch@irxoperatorfont{deg}_{\ch@irxscriptfont{a}}}
```

5.7.31 Inner Products

```
             \SP
                  862 \DeclarePairedDelimiter{\SP} {\langle}{\rangle}
     \littlepara
                  863 \newcommand{\littlepara}{{\scriptscriptstyle\parallel}}
              \IP
                  864 \newcommand{\IP}[6][{}]{\decorate*[^{#2}_{#3}]{\SP[#1]{#4}}{^{#5}_{#6}}}
                  865 \fi
```

First we check of macros should be included:

```
                  866 \if@loadmath
```

5.7.32 General Statistics

```
              \EX
                  867 \newcommand{\EX}{\operatorname{\ch@irxoperatorfont{E}}}
             \Var
                  868 \newcommand{\Var}{\operatorname{\ch@irxoperatorfont{Var}}}
             \Cov
                  869 \newcommand{\Cov}{\operatorname{\ch@irxoperatorfont{Cov}}}
```

```
\Cor
870 \newcommand{\Cor}{\operatorname{\ch@irxoperatorfont{Cor}}}
871 \fi
```

First we check of macros should be included:

```
872 \if@loadmath
```

5.7.33 General Topology

```
\cl
873 \newcommand{\cl}{\ch@irxscriptfont{cl}}
\scl
874 \newcommand{\scl}{\ch@irxscriptfont{scl}}
\interior
875 \newcommand{\interior}{\circ}
\boundary
876 \newcommand{\boundary}{\partial}
\supp
877 \newcommand{\supp}{\operatorname{\ch@irxoperatorfont{supp}}}
\dist
878 \newcommand{\dist}{\operatorname{\ch@irxoperatorfont{dist}}}
\topology
879 \newcommand{\topology}[1]{\ch@irxtopologyfont{#1}}
\filter
880 \newcommand{\filter}[1]{\ch@irxfilterfont{#1}}
\sheaf
881 \newcommand{\sheaf}[1]{\ch@irxsheaffont{#1}}
\Sections
882 \newcommand{\Sections}{\operatorname{\ch@irxoperatorfont{Sections}}}
\HOM
883 \newcommand{\HOM}{\operatorname{\ch@irxsheaffont{H}\!\mathit{om}}}
\etale
884 \DeclarePairedDelimiter{\etale}{\lvert}{\rvert}
```

5.7.34 Categories from Topology

\topological
```
885 \newcommand{\topological}{\categoryname{top}}
```
\Topological
```
886 \newcommand{\Topological}{\categoryname{Top}}
```
\Sheaves
```
887 \newcommand{\Sheaves}{\categoryname{Sheaves}}
```
\PreSheaves
```
888 \newcommand{\PreSheaves}{\categoryname{PreSheaves}}
```
\Etale
```
889 \newcommand{\Etale}{\categoryname{Etale}}
890 \fi
```