MAT114: Latex IV

UserGuide XX

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Info: This is the user guide document to the customized latex document class *hw.cls*.

Contents

1 Introduction

The DocumentClass *hw.cls* aims to provide a simple and easy template for writing math notes on latex. The link to hw.cls, Example.tex, and Template.tex can be found at https://github.com/a-little-bear/Latex-Template.

Here is the template of a new tex file (note that all 6 `\def` and the cover command are optional):

```
\documentclass[12pt, brown, sepia, 0.5in]{hw}

% \def\course{}
% \def\headername{}
% \def\name{}
% \def\email{}
% \def\info{}
% \def\logo{}

\begin{document}

% \coverpage[clsfiles/stars]



\end{document}
```

2 Settings

2.1 Document Preamble

`\documentclass[#pt,#in,{geye,hazy,sepia,night},{green,...}]{hw}`

#pt: font size, default 12pt, 9pt to 13pt

#in: margin, 1in or 0.5in

{geye, hazy, sepia, night}: green, white, or yellow background; or dark mode (best with white or sakura)

{green,cyan,blue,sakura,black,brown,white,red,orange,purple}: main color

`\def\course{#}`
#: course name

`\def\headername{#}`
#: header name

`\def\name{#}`
#: author name

`\def\email{#}`
#: author email

`\def\info{#}`
#: abstract

`\def\logo{#}`
#: logo file path, the right image displayed on the cover page

2.2 Document Class

`\skippar{5pt}`
Space between paragraphs, Default: 5pt

`\indentpar{0pt}`
Indentation of the first line of a paragraph. Default: 0pt

`\thmstyle{definition}`
Theorem style from asmthm, Default: definition

`\defaultlanguage{python}`
Default Language for listings

`\thmopacity{0.8}`
Opacity of light mode tcolorbox (night mode -0.1), Default: 0.8

`\nightmodebackground{\clsfiles/nightsky}`
Background image for night mode

3 Commands

3.1 Formatting Commands

`\indenv[2][1]{\begin{adjustwidth}{#1cm}{}#2\end{adjustwidth}}`
Indented environment, use package *changepage*

```
Example: \indenv{
    This is an indented environment (multiple paragraphs)
}
\indenv[10]{
    This is an indented environment with 10mm indentation
}
```

`\np{\newpage}`

`\ds{\displaystyle}`

`\bb{\mathbb},\cal{\mathcal},\scr{\mathscr},\frak{\mathfrak},\bf{\mathbf}`
shortcut for math fonts command

`\tit{\textit},\trm{\textrm},\tsf{\textsf},\ttt{\texttt},\tsc{\textsc},\tbf{\textbf}`
shortcut for text fonts command

`\extractfootnote{#1}`
To show food note created within tcolorboxes (title or content), let #1 be the name of the environment, e.g. theorem definition

```
\newenvironment{proofcases}{
    \newcommand{\case}
    \newcommand{\subcase}
}
```

New environment for proof cases

3.2 TColorBox Commands

`\qbreak`
End the question and follow by the proof / solution

`\envbreak`
And a seperator line within an environment

`\tcbcnt`
Set the counter for tcolorbox theorem environment

`\newn,\newm,␣\newtbox`
New no/title tcolorbox

```
Example: \newn{
    This is a new notitle "note" tcolorbox
}
\newm{
    This is a new notitle "mathnote" tcolorbox
}
\newtbox[optional: #1]{
    This is a new titled "tbox" tcolorbox

}
```

`\newh,\newr,\newp,␣\neweg`
New asmthm theorem tcolorbox environment with prefixes

```
Example: \newh{
    This is a new "hint" asmthm tcolorbox environment
}
\newr{
    This is a new "remark" asmthm tcolorbox environment
}
\newp{
    This is a new "proof" asmthm tcolorbox environment
}
\neweg{
    This is a new "Example" asmthm tcolorbox environment
}
```

`\newq,\newcl,\newd,\newco,\newt,\newl,\newe,\newu,\newch`
New TColorBox theorem environment with titles

```
Example: \newq[optional: #EnvName]{#label}{
    This is a new "question" tcolorbox theorem environment
}
\newcl[optional: #EnvName]{#label}{
    This is a new "claim" tcolorbox theorem environment
}
\newd[optional: #EnvName]{#label}{"definition"}
\newco[optional: #EnvName]{#label}{"corollary"}
\newt[optional: #EnvName]{#label}{"theorem"}
\newl[optional: #EnvName]{#label}{"lemma"}
\newe[optional: #EnvName]{#label}{"exercise"}
\newu[optional: #EnvName]{#label}{"unit"}
\newch[optional: #EnvName]{#label}{"chapter"}
```

`\ref{#1:#label}`
Use ref to reference the environment, where #1:#label e.g. is ”question:q1”

`\tbox[optional:#1]{#2}`
optional #1 define more options, #2 is the centered title

3.3 Math Commands

`\numberthis`
Add the line number in unnumbered math environment

`\T[1]{\text{#1}}`
Abbreviation of \text{}

`\Aleq[3]{#1 &=#2 &\text{#3}&&\\}`

(left) = (right) + (explanation)

Similarly `\Alleq`, `\Algeq` are for $\leq, \geq$.

`\cdf{\cdot}`
Abbreviation of \cdot

`\st{\text{␣s.t.␣}}`
Abbreviation of \text{ s.t. }

`\ie{\text{␣i.e.␣}}`
Abbreviation of \text{ i.e. }

`\eg{\text{␣e.g.␣}}`
Abbreviation of \text{ e.g. }

`\alt[1]{\intertext{#1}}`
Insert line between align math equations, \\ included

`\D{\mathop{}\!\mathrm{d}}`
d symbol for differentiation, example: \D x

`\DD[2]{\frac{\D #1 }{\D #2}}`

Leibniz's notation of differentiation, example: \DD{x}{y}

`\sgn{sgn}`
defined math operator sgn as the sign function

`\over{#1}{#2},\under{#1}{#2},\overunder{#1}{#2}{#3}`
Abbreviations of overset underset, follow the order from top to bottom

3.4 Symbol Abbreviations

3.4.1 Greek Letters

All letters have been shortened into the first 2 letters (or 1 if the total length is 1). For example,

```
\al -> \alpha
\Al -> \Alpha
\be -> \beta
\ph -> \phi
\om -> \omega
\Om -> \Omega
```

The variable versions are also included, for example,

```
vep -> \varepsilon
vph -> \varphi
vOm -> \varOmega
```

3.4.2 Other symbols and Operations

```
\C -> \mathbb{C} == complex
\R -> \mathbb{R} == reals
\Q -> \mathbb{Q} == rationals
\Z -> \mathbb{Z} == integers
\N -> \mathbb{N} == naturals
\F -> \mathbb{F} == field

\p -> \partial

\? -> \stackrel{?}{=} == question mark on equal sign
\ra -> \rightarrow == rightarrow (single line)
\Ra -> \Rightarrow == Rightarrow (double lines)
\is -> \equiv == equivalent (triple lines)
\sse -> \subseteq
\injective \surjective \bijective

\arr = angle brackets
\bra = parenthesis ()
\sqrbra = square brackets []
\curbra = curly brackets {}
\abs = absolute value | |
\norm = double absolute ||| ||
\ceil = ceiling + () + ceiling
\floor = floor + () + floor
\near = floor + () + ceiling

\func[3]{#1: #2 \rightarrow #3} == function (name, domain, codomain)
\Pset{#} -> \mathcal{P}(#) == power set
\Relate{#}{##} -> #\mathcal{R}## == relation
\GF[1][2]{\bb{F}_{#1}} == Galois field, default #1 = 2
\modulo[1][n]{\Z/#1\Z} == modulo, default #1 = n

\P -> \mathbb{P} == primes
\nil -> \varnothing == empty set
\O -> \mathcal{O} == big O
\relate -> \mathcal{R} == relate (relation)

\Dar[1][1] = scaled Downarrow
\dar[1][1] = scaled downarrow
\Uar[1][1] = scaled Uparrow
\uar[1][1] = scaled uparrow
```

3.5 Image and Listing

3.5.1 Image

Floating and centered figure with fixed ratio:

```
\fig[
    width=0.5\textwidth,
    height=0.5\textheight,
    label={},
    caption={},
    Optionals
]{path}
```

Only path is required, optional keys are also available.

3.5.2 Listing

Listings need to be accessed through the begin and end method:

```
\begin{code}[language=\defaultlanguage]
...
\end{code}

\begin{latexcode}[language=[LaTeX]Tex]
...
\end{latexcode}
```

4 Other Notable Commands

```
\renewcommand{\qedsymbol}
{$_{\scriptstyle \substack{\sc{quod}\\\sc{erat}\\\sc{dem}
\scalebox{0.53}{$\blacksquare$}}}$}
```

Modified QED symbol

5 Additional Packages

5.1 MAT240

`\vspan{span}`
span in linear algebra, Math Operator

`\rank{rank}`
rank in linear algebra, Math Operator

`\im{im}`
image in linear algebra, Math Operator

5.2 CSC240

`AND,OR,IMPLIES,IFF,XOR`

`\aand,\oor,\iimplies,\iif,\xor`
The weird symbols for CSC240

5.3 Alg

This is a package designed for pseudocode. For sample usage please refer to Example.tex

`\usepackage[noend,noline]{clsfiles/alg}`

noend parameter removes the ending keywards, noline removes the line numbers.

To use the algorithm / aogirithmic environment: `\newalg[]{}` where the optional parameter is the title of the algorithm.

```
\afunc{name}{para}{content}
\afor{condition}{content}
\aforall{condition}{content}
\awh{condition}{content}
\arep{content}{termination}
\aproc{name}{para}{content}
\alo{content}

\aif{condition}{
    content
\aelif{condition}
    content
\aelse
    content
}

\as \State - new line
\ase \Statex - new line without line number
```

Moreover,

```
\ato - bolded to
\alen{#1} - $#1.length$
\ag{#1}{#2} - $#1 \gets #2$
```

6 Known Bugs / Improvements

1. Nest chapter, exercise, unit together are unlickly to work.
2. To improve readability, the environments should try to not be nested, especially during page breaking.
3. The number counters cannot align with section numbers (counters are not well defined).
4. The color box sometimes touches the footer.
5. Make sure use `\np` or `\newpage` for new exercise/unit/chapter so that the page splitting functions properly (due to nested tcolorbox force breakable bug).
6. Allow more line spacing for alg package.