Mathematics for TeX archive

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Intro

This document lists mathematics for TeX snippets. Copy to `inc_mathematics.tex` (or do anything else) as required.

Environments

This works in article et al., but b0rks in presentation.

```
% --- math packages (in ArchLinux they're all part of TeXLive) ---
\usepackage{amsmath}    % has to come before eulervm, or things bork!
\usepackage{amsthm}     % required for proof environ (et al.).
\usepackage{amssymb}    % required (at least) for proof environ black square.
% --- END math packages ---

% If no newline after theorem et al environment,
% then no indentation either.
\makeatletter
\patchcmd{\@endtheorem}{\@endpefalse}{}{}{}
\patchcmd{\endproof}{\@endpefalse}{}{}{}
\makeatother

% math theorem environments
\newtheorem{theorem}{Theorem}[section]
\newtheorem{corollary}[theorem]{Corollary}
\newtheorem{lemma}[theorem]{Lemma}
\newtheorem{definition}[theorem]{Definition} % 'def' cannot be used as environ name.
\theoremstyle{remark}
\newtheorem{remark}[theorem]{Remark}

\renewcommand\qedsymbol{$\blacksquare$}
```

Functions

Arguments: letter that names the function, object set, range set.

```
\newcommand\funcdecl[#3]{#1\colon #2 \rightarrow #3}
```

Arguments: independent variable, function expression.

```
\newcommand\funcdef[#2]{#1 \mapsto #2}
```

Quantifiers

It's a cheat but this makes spacing less wrong around quantifiers:

```
\DeclareMathOperator{\Nexists}{\nexists}
\DeclareMathOperator{\Exists}{\exists}
\DeclareMathOperator{\Forall}{\forall}
```

Algebraic stuff

Sets

For set conditional definition. Unknown if works for presentation.

```
\usepackage{mathtools}
% https://tex.stackexchange.com/questions/180308/why-dont-the-curly-braces-and-the-mid-bar-l
\providecommand\given{}  % just to make sure it exists
\newcommand\SetSymbol[1][]{\nonscript\:#1\vert\nonscript\:\allowbreak}
\DeclarePairedDelimiterX\Set[1]\lbrace\rbrace{\, %
  \renewcommand\given{\SetSymbol[\delimsize]}#1 \,}
```

The extra space is according Knuth's recommendation (only) for conditionally defined sets[1]. Example usage:

```
\Set[\Big]{x \in \mathbb{Q} \given \left(\frac{x}{2}\right)^2=1}
```

The optional argument is to correct the size of braces and middle bar, if necessary.

For "regular" extensively (and thus non conditionally) defined sets, use something like:

```
\newcommand\eSet[1]{\{#1\}}
```

[1] https://tex.stackexchange.com/questions/37789/using-colon-or-in-formulas

Vectors et al

For `\norm` and `\abs` (starred versions grow when needed):

```
\usepackage{mathtools}
\DeclarePairedDelimiter\abs{\lvert}{\rvert}
\DeclarePairedDelimiter\norm{\lVert}{\rVert}
```

Relation vs. Operator

Short and simple:

```
% \mid -> binary relation
% \vert -> binary operator
```