Theorem Environments

\LaTeX\ for Math and Science

Fall 2007 Week 5
Structure of a Theorem Environment

- \texttt{\texttt{\textbackslash newtheorem\{\textit{environment name}\}\{\textit{displayed name}\}}}
- \texttt{\texttt{\textbackslash newtheorem\{thm\}\{Theorem\}}}

\texttt{\texttt{\texttt{\begin{thm}\texttt{This is a theorem.}\texttt{\end{thm}}}}}

\texttt{Theorem 1}

\textit{This is a theorem.}
\documentclass{amsart}
\usepackage{amsmath,amssym,amsthm}

\newtheorem{thm}{Theorem}

\begin{document}
\begin{thm}
This is an amazing theorem.
\end{thm}

\end{document}
Like other math environments, theorems don’t have to be numbered.

\begin{itemize}
  \item \texttt{\textbackslash newtheorem*\{environment name\} \{displayed name\}}
  \item \texttt{\textbackslash newtheorem*\{thm2\} \{Theorem\}}
\end{itemize}

\begin{thm2}
This is an unnumbered theorem.
\end{thm2}

This is an unnumbered theorem.
In general, every \texttt{\newtheorem} has its own counter. For example, if we have theorem declarations 
\texttt{\newtheorem{thml}{Theorem}} and \texttt{\newtheorem{theorem}{Theorem}} in the preamble, we can get a mess like:

\begin{thml}
Stuff
\end{thml}
\begin{theorem}
Other stuff
\end{theorem}
We can avoid that mess by linking the numbering:
\newtheorem{cor}{Theorem}[theorem]{Corollary}

\begin{theorem}
A theorem.
\end{theorem}
\begin{cor}
A corollary.
\end{cor}

Theorem 2
A theorem.

Corollary 3
A corollary.
Theorem numbers can be linked with sections, subsections, chapters and so on.

- \texttt{\newtheorem{env. name}{display name}} [link]
- \texttt{\newtheorem{sectheorem}{Theorem}} [section]

\begin{sectheorem}
A theorem numbered with the section.
\end{sectheorem}

\textbf{Theorem 1.1}

\textit{A theorem numbered with the section.}
\begin{theorem}[Dead Guy’s Name]
Some dead guy’s theorem.
\end{theorem}

\textbf{Theorem 4 (Dead Guy’s Name)}

\textit{Some dead guy’s theorem.}
What happens when you don’t want italicised theorems? \texttt{\textbackslash theoremstyle} to the rescue!

\begin{verbatim}
\newtheorem{thm}{Theorem}
\newtheorem{thm1}{Theorem}
\newtheorem{theorem}{Theorem}
\newtheorem{sectheorem}{Theorem}[section]
\newtheorem{cor}[theorem]{Corollary}
\newtheorem*[thm2]{Theorem}
\texttt{\textbackslash theoremstyle}\{\texttt{definition}\}
\newtheorem{defn}{Definition}
\texttt{\textbackslash theoremstyle}\{\texttt{remark}\}
\newtheorem*[remark]{Note}
\end{verbatim}
The Different Styles

- **plain**: The default; plain heading, italicised text
- **definition**: plain heading, plain text
- **remark**: italicised heading, plain text
amsthm provides a bonus: the proof environment.

Proof.

This could be the proof of something. Note the Halmos box at the end. Using \begin{proof}[something] replaces the word “proof” with “something”. Typically, the heading will be italicised.
Defining Commands

- \newcommand{\textit{name}}{arguments}{\textbf{command}}
- \newcommand{\textit{bR}}{\textit{mathbb}{R}}
- \newcommand{\textit{bold}[1]}{\textit{mathbf}{#1}}
- \newenvironment{\textit{name}}{arguments}{\textit{at begin}}{\textit{at end}}
Useful Information

- Up to 9 arguments are allowed.
- You can’t open a brace in the “at begin” commands and close it in the “at end”.
- **Using** \ensuremath will force math mode:
  \newcommand{\bR}{\ensuremath{\mathbb{R}}}{}
- \renewcommand and \renewenvironment will override already existing definitions. This is very very dangerous!
- One optional argument is possible. It will be \#1 and it’s default value goes in brackets after the number of arguments. \command[opt]{mand}