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Worksheet 3 (Solution)

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All required data for this worksheet is supplied in week-03.zip.

All solution files can be found in week-03-sol.zip.

Problem 3.1. (Math Formatting)

The supplied `problem-3-1-stub.tex` builds without errors, but it is incomplete and improvable in source style. Complete the file so that it builds without errors and renders like the supplied `problem-3-1-sol.pdf`, with the exception of your names and matriculation number, which should be replaced by your actual data.

Proceed as follows:

(a) Where possible, replace the given commands in the first section of the source with their preferable alternatives as presented in the lecture.

(b) Add the missing second section. Make sure to use the preferred commands here as well.

Solution.

In the first section, the following replacements are made:

- The field of reals is set in blackboard bold, so `\mathbf{R}` becomes `\mathbb{R}`, which requires loading `\usepackage{amssymb}`.
- Definitions are written with `\coloneqq` rather than `:=`, whose colon sits too low. This command, like the paired delimiters below, comes from `mathtools`, which we load in every document with mathematics.

- Instead of typing delimiters by hand, we declare paired delimiters once in the preamble, i.e.,

  ```
  \DeclarePairedDelimiter{\abs}{\lvert}{\rvert}
  \DeclarePairedDelimiter{\norm}{\lVert}{\rVert}
  \DeclarePairedDelimiter{\paren}{\lparen}{\rparen}
  ```

  and use them throughout: `\norm{x}` for `\| x \|`, `\abs{...}` for the hand-written `| ... |`, and `\paren{...}` for `\left( ... \right)`, which otherwise grows too large and adds space. The two-argument inner product `\inner` is declared analogously in the preamble with `\DeclarePairedDelimiterX`, and a short `\newcommand` defines `\metr`, so that `d(x, y)` becomes `\metr{x}{y}`.
- The fraction is set with `\frac` instead of the plain TeX construction `\over`.
- Operator names are set upright: `cos` becomes `\cos`, and the projection, written `\mathrm{proj}` by hand, is declared once as an operator with `\DeclareMathOperator{\proj}{proj}`.
- Finally, `\not=` is replaced by `\neq`, and the literal `...` by the ellipsis `\ldots`.

The missing second section on the exponential function is then added so that it renders like the supplied `problem-3-1-sol.pdf`. Its defining series is set as a numbered `equation` carrying a `\label`, so that the closing sentence can point back to it with `\zcref`. It further uses the operators `\exp` and `\lim`, the upright differential `\textup{d}`, and the size-matched delimiter `\paren[\Big]{...}` around the tall fractions.