# Math in ConTEXt: Bridging the gap with (AMS-)LATEX

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### Abstract

The core of ConTEXt development is focused on the textual aspects of typography in TEX: many features are provided that easily compete with and surpass those of other high-level TEX formats, like LATEX. Progress has been lagging, though, in the field of mathematical typesetting. This talk presents a work-in-progress whose final purpose is to provide the features of the most common and powerful mathematical packages in LATEX (AMS and Nath) in the form of ConTEXt modules, possibly with the addition of new features in the spirit of interactivity and graphical richness which is typical of ConTEXt's textual features.

## Introduction

One of the strongest points of ConTEXt is its extensive capability to deal with text documents, which make it the most appropriate format for nontechnical writings. At the same time, this is also one of its weakest points: the development of text-based features has been done at the expense of mathematical capabilities, which have therefore made ConTEXt less appealing in technical/scientific environments, where LATEX is still the preferred format. The core math capabilities in ConTEXt have in fact been for a long time barely superior to those of plain TEX, making math cumbersome to type (at least for those coming from a LATEX background).

At one time, a ConTEXt module (`m-math`), developed by Taco Hoekwater, brought to ConTEXt most of LATEX's environments, macros, and mathematical font capabilities, with additional features from even more packages (notably `breqn`). However, the module made extensive changes to some core macros, especially font-related ones. Thus, when ConTEXt underwent a thorough redesign (with a completely new font loading/selection mechanism, based on typescripts) the `m-math` module was effectively broken.

It is the writer's intention to bring powerful and easy math back to ConTEXt. In particular, we aim for:

1. providing the functionality of (AMS-)LATEX and Nath, with as much ease if not necessarily the same syntax;
2. providing as much command compatibility as possible, so that compatible commands/environments are achieved with the same or very similar commands;
3. (low priority) adding new features without breaking anything, in the spirit of graphics and interactivity peculiar to ConTEXt;
4. (low priority) ensuring that documents look the same (or as similar as possible) to those obtained with (AMS-)LATEX when no extra ConTEXt features are used (to customize section headings, itemizations, numbering, etc.).

## Project status

The major overhaul that broke the `m-math` package also provided the basis for potentially augmenting ConTEXt's math capability. Much work has been done to offer in ConTEXt a symbol set as extensive as that of LATEX, and basic math environments have been provided. A new math module (`m-newmat`) has been developed, as a placeholder to add new features as the need arises.

Starting from this base, I'm developing two new packages: `t-amsl`, focused on AMS-LATEX compatibility, and `t-nath`, to bring the ease of use and power of Nath (a package developed by Michal Marvan, presented at the EuroTEX 2001 conference, implementing NAtural maTH notation) to ConTEXt.

Nath is almost fully implemented. This has been obtained by using the same source as the LATEX package itself, with due adaptation. Some interesting side-effects of the adaptation of Nath to ConTEXt were the discovery of a couple of bugs, and some format-independent work on robustness, both macro-wise (allowing for example extensible arrows in the sub- or superscript part of another extensible arrow) and engine-wise (making Nath aware of $\varepsilon$-TEX and therefore allowing it to typeset more complex formulas, a job which requires a notably large number of registers).

Work to date on the AMS macros is much less extensive: it currently implements some basic environments (equation alignment and gathering) and some classic macros like `\eqref`. It also provides some non-AMS but important LATEX math environments like `array`; some of these may be moved to the `m-newmat` module in the future, to leave AMS-specific macros only in the `t-amsl` module.

Finally, the module restores (in math mode) LATEX-style behavior of a few font-selection commands; selection mechanisms for such fonts were already present in ConTEXt, but they were text-centric (quod erat demonstrandum) and therefore cumbersome to use in math mode; `t-amsl` makes them again available in math mode as well, with the familiar `\mathcal`, `\mathfrak`, etc. command interface (as well as `\cal`, `\frak`, etc.).

## Project future

On the one hand, one might think that there is still much work to do, (re)implementing all the various LATEX and AMS-LATEX environments; on the other hand we should consider the level of compatibility we actually want between the packages.

As a first step, it is important to provide the same typesetting power, as easily as or more easily than in LATEX. For example, the advanced math typesetting features of Nath make many of the AMS environments unnecessary. We therefore prefer to concentrate initially on completing the port of Nath.

After this has been provided, and for the remaining needs which are not dealt with by Nath, we will move to improving command compatibility with the AMS-LATEX environments, so as to let the transition from one typesetting environment to the other be as smooth and painless as possible. If possibly, aesthetical compatibility will be preserved (or created as necessary), to allow ConTEXt-typeset documents to be usable for standard journal submissions.

When choosing whether to be compatible with one system or the other, in some cases the LATEX way of doing things will be abandoned in favour of the ConTEXt one, when the latter makes more sense or is easier to manipulate, from the user's perspective and in the author's opinion. For example, for theorem creation and management the rigid positional configuration options of AMS-LATEX will be abandoned in favour of the dynamic key/value configuration capabilities which are standard in ConTEXt; the LATEX form might still be provided for compatibility, but this will have a lower priority.

Finally, new features might be included to allow typesetting of more "ConTEXtual" math formulas: features like interactive formulas (click to cycle through passages), or "hidden" explanatory passages that display in pop-up windows will be implemented (some of these are already in the works).