README

xint 1.3f

2019/09/10


```
Source:  xint.dtx 1.3f 2019/09/10 (doc 2019/09/10)
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Info:    Expandable operations on big integers, decimals, fractions
License: LPPL 1.3f
```

This `README` is also available as `README.pdf` and `README.html`.

Change log is to be found in `CHANGES.pdf` or `CHANGES.html`.

The user manual is `xint.pdf`, and the commented source code is available as `sourcexint.pdf`.

Aim

The basic aim is provide *expandable* computations on integers, fractions, and floating point numbers. For example

```
\xinttheexpr reduce(37189719/183618963+11390170/17310720)^17\relax
```

will evaluate exactly the fraction; the result has 462 characters (including the fraction slash.) One can also work with dummy variables:

```
\xinttheexpr mul(add(x(x+1)(x+2), x=y..y+15), y=171286,98762,9296)\relax
```

evaluates to `1597906634613582990232800795944856366709919078 4`.

Float computations are possible at an adjustable precision (default 16).

```
\xintDigits:=48;\xintthefloatexpr 123_456_789^1_000.5\relax
->3.6369276182278267993073827051574079737081369193 8e8095
```

(as this example shows the underscore character can be used to separate visually digits, one can also use the space character for that purpose).

Square-root and the four operations achieve correct rounding in the given arbitrary precision.

Trigonometric functions (direct and inverse) are available with a maximal precision of 60 digits.

Logarithms and exponentials are available using the poormanlog package which provides only 8 or 9 digits of precision. This will be increased in future.

Usage

It is possible to use the package both with Plain (`\input xintexpr.sty`) or with LaTeX (`\usepackage{xintexpr}`).

With LaTeX

```
\usepackage{xint}       % expandable arithmetic with big integers
\usepackage{xintfrac}   % decimal numbers, fractions, floats
\usepackage{xinttools}  % expandable and non expandable loops
\usepackage{xintexpr}   % expressions with infix operators
```

The `xinttrig` and `xintlog` packages are loaded automatically by `xintexpr` and will refuse to be loaded directly.

Further packages: `xintbinhex`, `xintgcd`, `xintseries` and `xintcfrac`.

Main dependencies are handled automatically. For example `xintexpr` automatically loads `xinttools` and `xintfrac` (which itself loads `xint`). Hexadecimal input requires explicit loading of `xintbinhex`.

Package `xintcore` is the subset of `xint` providing only the five operations on big integers: `\xintiiAdd`, `\xintiiMul`, ...

The LaTeX package bnumexpr defines a more light-weight parser of arithmetical expressions using big integers, which supports only the four operations, the modulo operation, the power operation, and the factorial. By default it uses the macros from `xintcore` but this can be customized.

The LaTeX package polexpr is based upon `xintexpr` and allows formal algebra with polynomials, and finding all real roots with arbitrary precision.

With TeX

One does for example:

```
\input xintexpr.sty
```

This will automatically load `xintfrac.sty`, `xinttrig.sty`, `xintlog.sty` and `xinttools.sty`. The packages may be loaded in any catcode context such that letters, digits, `\` and `%` have their standard catcodes.

`xintcore.sty` and `xinttools.sty` both import `xintkernel.sty` which has the catcode handler and package identifier and defines a few utilities such as `\oodef/\fdef`, `\xint_dothis/\xint_orthat`, or `\xintLength`.

Since `1.3b`, `xintkernel.sty` also provides `\xintUniformDeviate` which is a wrapper of the engine `\pdfuniformdeviate` or `\uniformdeviate` done to guarantee more uniformity of the pseudo-random integers.

Installation

Method A: using the package manager of your TeX distribution

`xint` is included in TeXLive (hence also MacTeX) and MikTeX.

There can be a few days of delay between apparition of a new version on CTAN and availability via the distribution package manager.

Method B: manual installation using `xint.tds.zip` and `unzip`

Assumes a GNU/Linux-like system (or Mac OS X).

1. obtain `xint.tds.zip` from CTAN: http://mirror.ctan.org/install/macros/generic/xint.tds.zip
2. cd to the download repertory and issue:

   ```
   unzip xint.tds.zip -d <TEXMF>
   ```

   where <TEXMF> is a suitable TDS-compliant destination repertory. For example, with TeXLive:

   - Linux, standard access rights, hence sudo is needed, installation into the "local" tree:

     ```
     sudo unzip xint.tds.zip -d /usr/local/texlive/texmf-local
     sudo texhash /usr/local/texlive/texmf-local
     ```

   - Mac OS X, installation into user home folder (no sudo needed, and it is recommended to not have a ls-R file there, hence no texhash):

     ```
     unzip xint.tds.zip -d  ~/Library/texmf
     ```

Method C: manual installation using `Makefile` and `xint.dtx`

The Makefile automatizes rebuilding from `xint.dtx` all documentation files as well as `xint.tds.zip`. It is for GNU/Linux-like (inc. Mac OS X) systems, with a teTeX like installation such as TeXLive. The Latexmk and Pandoc softwares are required to build all the documentation.

1. obtain `xint.dtx` and `Makefile` from http://mirror.ctan.org/macros/generic/xint.
2. put them in an otherwise empty working repertory, run `make` or equivalently `make help` for further instructions.

Method D: installation starting with only `xint.dtx`

Run `etex xint.dtx` to extract from `xint.dtx` all macro files as well as auxiliary files needed for building the documentation. Among them there is `Makefile.mk`. If you are on a GNU/Linux-type system, rename the file to `Makefile` and execute `make` on command line for further help. If you can't use `make` read the contents of the `Makefile` for instructions.

Finishing the installation in a TDS hierarchy:

- move the style files to `TDS:tex/generic/xint/`
- `xint.dtx` goes to `TDS:source/generic/xint/`
- The documentation (xint.pdf, README.md,. . .) goes to `TDS:doc/generic/xint/`

Depending on the destination, it may then be necessary to refresh a filename database.

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