**Installation Instructions for 4ti2 and math4ti2.**

Ralf Wahner and Nicolas Allen Smoot

The following installation steps are valid for Windows 10 Professional and have been written and verified in April 2021. First off, visit the “cygwin.com” site, download the small installer “setup-x86\_64.exe” and run the installer as administrator. Select a nearby download server to speed up the package transfer. At the time of this writing the Cygwin version is 3.2.0; use “cygcheck -V” to get the version number.

In the package selection screen check the following items for installation:

binutils

gcc-core

gcc-g++

libgmp10

make

wget

glpk

libglpk-devel

libgmp-devel

libtook

automake

autoconf

autogen

Note, that the pacage “gmp” (GNU Multiple Precision Arithmetic Library) is no longer among the Cygwin packages, but if you need this package, you can download the source code from the gnu site, compile and install in the cygwin environment similar to the below procedure for “4ti2.” The software environment is sufficiently prepared when the above packages are installed. After the installation ends, visit the Windows 10 congrol panel, open the dialog to edit environment variables for your own account and add

C:\cygwin64\bin

and

C:\cygwin64\usr\local\bin

to the PATH variable. At this point “cygwin” is completely installed.

Create a new folder “software” in your personal folder “C:\Users\[your name].” Visit the “4ti2” github repository “github.com/4ti2/4ti2,” download and decompress the archive file “4ti2-master.zip” in the new “software” folder. The absolute path to the “4ti2” directory reads “C:\Users\[your name]\software\4ti2-master” in Windows 10, and “/cygdrive/c/Users/software/4ti2-master” in Cygwin. We now want to switch to Cygwin and install the “4ti2” package.

From the Windows 10 Start menu run “cygwin terminal” as administrator and type “cd/cygdrive/c/Users/software/4ti2-master” on the command lineto get the “4ti2” directory described in the previous paragraph. Type in the following for commands one after the other:

./autogen.sh ### writes the “configure” script

./configure ### writes the “Makefile”

make

make install

Note, that these steps have been verified in April 2021 with “4ti2” version 1.6.9 and might change in the future. If you get into trouble at this point of the installation steps, consider consulting the documentation included in the archive file “4ti2-master.zip” or on the github repository.

At this point “4ti2” is completely installed and just two settings remain. The Mathematica environment variable “$UserBaseDirectory” points to the Mathematica home directory, where Mathematica is installed and begins to search for Mathematica libraries (“\*.m”-files). The value should be similar to “C:\Users?[your name]\Library\Mathematica.” Note that the Mathematica home directory contains a subdirectory “Applications” (not to be confused with “ApplicationData”). The “Applications” subdirectory will contain a new “\*.m” library file, yet to be downloaded.

Get the “math4ti2.m” library file by Ralf Hemmecke and Silviu Radu from “risc.jku.at/research\_topic/computer-algebra-for-combinatorics” and save the file in the “Applications” directory mentioned above. Finally, open “math4ti2.m” and set “zsolvecmd=zsolve.exe.” The installation procedure ends here. Best wishes for your work!