Introduction to the simplex package

Calling Sequence:

simplex[function](args)
function(args)

Description:

• The simplex package is a collection of routines for linear optimization using the simplex algorithm as a whole, and using only certain parts of the simplex algorithm.

The particular implementation of the simplex algorithm used here is based on the initial chapters of “Linear Programming” by Chvatal, 1983, W.H. Freeman and Company, New York.

• In addition to the routines feasible, maximize and minimize, the simplex package provides routines to assist the user in carrying out the steps of the algorithm one at a time: setting up problems, finding a pivot element, and executing a single pivot operation.

• The functions available are:

  basis  convexhull  cterm  define_zero  display
  dual   equality   feasible  maximize  minimize
  NONNEGATIVE  pivot  pivoteqn  pivotvar  ratio
  setup  standardize

• See simplex[function] for more information on any of the functions listed above.

• To maximize a linear function f subject to the set of linear constraints c, use with(simplex) followed by maximize(f,c).

• To use a simplex function, either define that function alone using the command with(simplex, function), or define all simplex functions using the command with(simplex). Alternatively, invoke the function using the long form simplex[function]. This long form notation is necessary whenever there is a conflict between a package function name and another function used in the same session.

Examples:

> with(simplex):

Warning, the protected names maximize and minimize have been redefined and unprotected

> cnsts := {3*x+4*y-3*z <= 23, 5*x-4*y-3*z <= 10,
            7*x+4*y+11*z <= 30}:

> obj := -x + y + 2*z:
\texttt{maximize(obj, cnsts union \{x >= 0, y >= 0, z >= 0\});}

\[
\begin{aligned}
\{x &= 0, z = \frac{1}{2}, y = \frac{49}{8}\}
\end{aligned}
\]